

UNITED STATES OF AMERICA
NATIONAL TRANSPORTATION SAFETY BOARD
OFFICE OF ADMINISTRATIVE LAW JUDGES

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In the matter of:

PUBLIC HEARING ON COLLISION OF
TWO WASHINGTON METROPOLITAN AREA
TRANSIT AUTHORITY TRAINS NEAR
FORT TOTTEN STATION, WASHINGTON,
D.C., JUNE 22, 2009

* * * * *

National Transportation Safety Board
490 L'Enfant Plaza East, S.W.
Washington, D.C. 20694

Thursday,
February 25, 2010

The above-entitled matter came on for hearing, pursuant
to Notice, at 8:59 a.m.

BEFORE: BOARD OF INQUIRY
National Transportation Safety Board (NTSB)

APPEARANCES:

Board of Inquiry

ROBERT SUMWALT, Chairman
JAMES RITTER, Acting Director, Railroad, Pipeline and
Hazardous Materials Investigations
JOSEPH KOLLY, Director, Research and Engineering
ED DOBRANETSKI, Hearing Officer/Investigator-in-Charge
GARY HALBERT, General Counsel

Technical Panel

STEVE KLEJST, Operations/Oversight
RICK DOWNS, Crashworthiness
CY GURA, Track/Engineering
RUBEN PAYAN, Signal and Train Control
RICK NARVELL, Human Performance
DANA SANZO, Survival Factors
DAVE WATSON, Mechanical
PAT SULLIVAN, Safety Recommendations
JAMES SOUTHWORTH, Chief, Rail Division
MARK JONES, Deputy Chief, Rail Division

Interested Parties

MICHAEL TABORN
Washington Metropolitan Area Transit Authority (WMATA)

MICHAEL FLANIGON
Federal Transit Administration (FTA)

THOMAS MCFARLIN
Federal Railroad Administration (FRA)

ERIC MADISON
Tri-State Oversight Commission (TOC)

NEAL ILLENBERG
Alstom Signaling, Inc.

ROBERT PASCOE
Union Switch and Signal Inc.

ANTHONY GARLAND
Amalgamated Transit Union (ATU)

LAWRENCE SCHULTZ
Washington D.C. Fire and EMS Department

APPEARANCES (Cont.):

Interested Parties (Cont.)

JACKIE JETER
Amalgamated Transit Union

Also Present

DEBORAH HERSMAN, Chairman, NTSB
CHRISTOPHER HART, Vice Chairman, NTSB
ELIAS KONTANIS, Office of Transportation Disaster
Assistance
BRIDGET SERCHAK, Public Affairs Specialist, Office of
Public Affairs
NANCY MASON, Administrative Support
DENISE WHITFIELD, Administrative Support

Witness Panel 6

KARLENE ROBERTS, Director
Center for Catastrophic Risk Management
University of California, Berkley

EARL CARNES, Senior Advisor
High Reliability
U.S. Department of Energy

RICK HARTLEY, Principal Engineer
B&W Pantex

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Adjourn

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P R O C E E D I N G S

(8:59 a.m.)

CHAIRMAN SUMWALT: And good morning. We are back in session. Mr. Dobranetski, are you ready to --

HEARING OFFICER DOBRANETSKI: Yes, Mr. Chairman.

CHAIRMAN SUMWALT: -- to qualify and introduce the next panel?

HEARING OFFICER DOBRANETSKI: Yes, Mr. Chairman. Good morning. The witnesses for Panel 6 are Dr. Rick Hartley, Mr. Earl Carnes and Dr. Karlene Roberts. Would you please raise your right hand and affirm that you will tell the truth?

(Witnesses sworn.)

HEARING OFFICER DOBRANETSKI: Starting with Dr. Roberts, would you state your full name, current employer, title and the organization you represent?

DR. ROBERTS: My name is Karlene Roberts and I am a professor at the University of California-Berkley and I'm also director of the Center for Catastrophic Risk Management at the University of California.

HEARING OFFICER DOBRANETSKI: And how long have you been in your current position?

DR. ROBERTS: I've been in my current position for 30 years.

HEARING OFFICER DOBRANETSKI: Could you give us a really brief description of what you have done and your duties

1 and responsibilities for the 30 years?

2 DR. ROBERTS: I teach in the High School of Business
3 at Berkeley and I teach a management course, and I've done
4 research on the design and management of organizations in which
5 errors can have catastrophic consequences.

6 HEARING OFFICER DOBRANETSKI: Thank you.

7 Mr. Carnes, would you state your full name, current
8 employer, title and your company address, please?

9 MR. CARNES: Yes, yes. My name is William Earl
10 Carnes. I'm currently employed by the United States Department
11 of Energy in our technical campus in Germantown, Maryland.
12 I've been with the Department for approximately 19 years.

13 HEARING OFFICER DOBRANETSKI: And your current
14 position with the Department of Energy?

15 MR. CARNES: Yes. I am the senior advisor for high
16 reliability and also the liaison for the Department for the
17 Institute of Nuclear Power Operations.

18 HEARING OFFICER DOBRANETSKI: Okay. And your duties
19 and responsibilities?

20 MR. CARNES: Yes. My duties are to advise the
21 management of the Department, management and leadership of the
22 Department, as well as our contractor partners on matters
23 relating to implementing high reliability concepts, causal
24 analysis, accident investigation, those type of subjects, and
25 also to liaison with our federal partners, other federal

1 agencies, in the application of those concepts to our
2 respective federal responsibilities.

3 HEARING OFFICER DOBRANETSKI: And how long have you
4 been employed by the Department of Energy?

5 MR. CARNES: For approximately 19 years with the
6 Department of Energy.

7 HEARING OFFICER DOBRANETSKI: Okay. Could you also
8 provide a brief description of what you've done in your prior
9 positions?

10 MR. CARNES: Yes. I was a university instructor for
11 a few years before entering the commercial nuclear power
12 industry. For approximately 15, 16 years I worked in the United
13 States commercial nuclear power industry, first with Utility,
14 subsequently with the Institute of Nuclear Power Operations,
15 following that as a management consultant with Utilities,
16 assisting Utilities in the United States and in Canada.

17 HEARING OFFICER DOBRANETSKI: Okay. Thank you, Mr.
18 Carnes.

19 Dr. Hartley, would you state your full name, your
20 current employer, your title and the organization's address?

21 DR. HARTLEY: Yes. My name is Richard Steven
22 Hartley. I'm employed by B&W Pantex in Amarillo, Texas. I'm a
23 principal engineer and I've been in that position since about
24 2002.

25 HEARING OFFICER DOBRANETSKI: Okay. And B&W stands

1 for what, was that former Babcock and Warner?

2 DR. HARTLEY: Babcock and Wilcox.

3 HEARING OFFICER DOBRANETSKI: Babcock and Wilcox,
4 okay. How long have you been in your current position?

5 DR. HARTLEY: I've been in the current position since
6 about 2002.

7 HEARING OFFICER DOBRANETSKI: And your duties and
8 responsibilities?

9 DR. HARTLEY: I'm the primary lead for Pantex
10 instituting this high reliability concept throughout the plant.
11 I'm also the lead in doing causal factors analysis which is
12 basically root cause analysis. When we have a small instance
13 at the plant we want to learn from these events and become a
14 better organization.

15 HEARING OFFICER DOBRANETSKI: And how long have you
16 been employed with this organization?

17 DR. HARTLEY: About nine years, since 2001.

18 HEARING OFFICER DOBRANETSKI: Okay. Could you also
19 provide a brief description of your positions and duties prior
20 to that position?

21 DR. HARTLEY: Yes, sir. Retired out of the Air Force
22 about 19 years. I was a nuclear weapons officer during that
23 period of time. Three or four years before coming to Pantex I
24 worked at the University Consortium involving the University of
25 Texas, Texas A&M and Texas Tech University supporting the DOE

1 on doing research.

2 HEARING OFFICER DOBRANETSKI: Thank you. Mr.
3 Chairman, this witness panel is qualified and the questioning
4 can be turned over to Mr. Narvell.

5 CHAIRMAN SUMWALT: Thank you, Mr. Dobranetski, and,
6 Mr. Narvell, please proceed.

7 MR. NARVELL: Thank you, Mr. Chairman. It's our
8 understanding that each of our panelists has respective
9 presentations and what I'd like to do with your permission is
10 to begin with Dr. Roberts and just go through all three of them
11 and then we'll come back for a round of questioning.

12 Dr. Roberts, please proceed.

13 DR. ROBERTS: Thank you. Well, I think I'll begin by
14 citing something that Chairman Sumwalt said to you yesterday
15 and that I think we should keep in mind as we move through our
16 remarks.

17 The Chairman mentioned that according to the American
18 Transportation Association four billion people a year ride the
19 rail transit in this country, and so I'm going to talk about
20 something that's not going to be esoteric to that issue. It's
21 going to -- all the things that I have done include a lot of
22 people in potentially dangerous places.

23 So, first of all, you might want to ask yourself what
24 is a high reliability organization, and I think each of the
25 three of us have somewhat different definitions, but I'm going

1 to start out with the most generic and let them add to it as
2 they see fit.

3 It's an organization or a system of organizations.
4 We sometimes forget that most of our organizations are not
5 single entities, but they're systems of organizations with
6 different cultures, an engineering culture, a marketing
7 culture, a set of different cultures, and they conduct
8 relatively error-free operations over a very long period of
9 time. And they make consistently good decisions resulting in
10 high quality and reliable operations, and the bottom line is
11 the bottom line, high quality and reliable operations.

12 Now here we have a perfect example of what many of us
13 see when our organizations get into trouble. We see that we
14 have an accident and we assume that the cause of the accident
15 is the worker at the low end of the totem pole, but the cause
16 may very often be something the worker did, but the worker may
17 be influenced by operational staff, by management of the
18 organization, by company regulations, by regulators, by
19 suppliers and by the government, and we can think of a whole
20 host of things beyond this that influence the bottom line which
21 is here an accident that happened that had severe consequences.

22 Robert Poole in Beyond Engineering made the statement
23 that I like a whole lot, in a generation or two the world will
24 likely need thousands of high reliability organizations running
25 not just nuclear power plants, space flight and air traffic

1 control, but a lot of other things including chemical plants,
2 electrical grids, computers, financial networks, genetic
3 engineering, nuclear waste storage, complex transportation
4 systems and other hazardous technologies. So our ability as a
5 group of managers might be the challenge of managing the
6 technology rather than our ability to conceive and build it, so
7 we may do a pretty good job of conceiving the technology and
8 building it, but managing it may be the limiting factor in many
9 cases.

10 And here's an example of an organization that does
11 pretty well at this. This is the USS Stennis flight deck of an
12 aircraft carrier and this is basically where I started my
13 research, on flight decks of aircraft carriers. You don't hear
14 about them in the newspaper a whole lot. This is the landing -
15 - the catapulting and recovery of F/A-18 Hornets on this
16 aircraft carrier and you don't hear about them a lot and yet
17 they land and catapult and recover aircraft once every 48
18 seconds when they're in operation, and the whole job is done by
19 6,000 young men, the average age of which is 19, and that
20 includes the 50-year-old admiral.

21 Our work began in 1985 by examining organizational
22 processes in a variety of organizations. I mean the processes,
23 the management processes, the things we do to keep the place
24 going. We looked at U.S. Navy carrier aviation operations. We
25 looked at the FAA's air traffic control operations. We looked

1 at commercial nuclear power plants, and you can well understand
2 that all of these organizations are organizations in which
3 errors can have absolutely catastrophic consequences, so can
4 big transportation systems, so can chemical plants, so a lot of
5 organizations today fit in this class of organizations.

6 I want to mention to you some organizational
7 processes that HRO theory addresses, and I'm talking about the
8 theory end of it and I am one of the leads of the research that
9 developed the theory, the necessity of simultaneously
10 considering systems of organizations as well as the
11 organizations in those systems, so you want to consider the
12 suppliers. You want to consider the operators. You want to
13 consider the ancillary folks. All of these people contribute
14 to the system and each one of their organizations is likely to
15 have very different cultures.

16 We want to think about how does design organizations
17 and systems of organizations so that they remain safe and,
18 therefore, we need to look at things like mindfulness, does
19 each manager have the whole organization in mind, the pieces of
20 the whole organization, how they fit together, the big picture
21 if you will.

22 We want to look at latent errors, latent errors that
23 bubble up and bite you, and I think a latent error for the
24 Metro system might be lack of resources. It bubbles up and
25 bites you. Differed maintenance, that tends to bubble up and

1 bite you in the end. And we want to look at how the
2 organizations coordinate it. In a world of specialization we
3 often forget to re-coordinate so we leave the left hand not
4 knowing exactly what the right hand is doing.

5 And, finally, we want to think about decentralized
6 decision-making or pushing the decision to the lowest level in
7 the organization compatible with the knowledge to make the
8 decision so the big cheese isn't always making the decision.
9 Sometimes very little cheeses are making the decision because
10 they have the appropriate information.

11 Now the kinds of organizations that we studied in
12 this body of research I want to mention just because they do
13 vary and they show something of the generalization of the
14 research to many kinds of organizations. U.S. Navy Carrier
15 Aviation - I spent five years on and off aboard the carriers,
16 the Nimitz-class carriers, the Federal Aviation
17 Administration's air traffic control system, as I mentioned,
18 commercial nuclear power plants.

19 We've looked at banks. I know you think that's funny
20 given our recent trend in banking, but we have looked at
21 several financial institutions, but also at SWIFT which moves
22 97 percent of the world's money, and if SWIFT fails, companies
23 like Barings Bank and Bank of America and all the rest of them
24 will just go get another consortium. They have to be able to
25 move money rapidly and accurately across the world.

1 School Reform - we found we have a set of schools in
2 Wales that over the last ten years has been sending kids to
3 college, never did that before.

4 California's electrical grid we've looked at in some
5 depth and wildland and urban firefighting. It's a big thing,
6 as you well know, when you hear stories of the wildland and
7 urban fires that damaged so much in California in 2007 and
8 2003.

9 Aviation, the Columbia space shuttle, and I want to
10 stop here and recommend to you that if you're interested in
11 this you take a look at the Columbia Accident Investigation
12 Board Report which is available to GAO. It is a stunning
13 report of how to avoid that kind of accident.

14 We've looked at some kinds of manufacturing, military
15 Army brigades, offshore oil platforms including Piper Alpha and
16 Texas City, the police force, a major police force, in
17 California, submarines and even United Kingdom train operators,
18 and there the issue was to look at the right-of-way and work
19 areas around the tracks.

20 A number of organizations today have implemented high
21 reliability organizational processes and I want to caution that
22 it's not always successful, but the reason it is not always
23 successful is because some of the implementers tried with
24 little understanding of the processes themselves, so we have to
25 understand high reliability organization processes in somewhat

1 greater depth than I've mentioned them to you in order to be a
2 success, so that's a limitation and it needs a great deal of
3 understanding.

4 Where successful, implementation requires great
5 understanding and constant effort, and we're going to hear some
6 stories of organizations that have done that. And, where
7 successful, the entire organization including the board is
8 involved and behind HRO, so it's not just the organizations,
9 but it's the leadership within the organizations and the boards
10 who govern policy for those organizations.

11 Now, some examples of implementation I thought you
12 might be interested in are -- and we're going to hear more
13 about -- are U.S. Department of Energy and some organizations
14 related to that. Commercial aviation has long been in this
15 game. It begun in the United States, but now spreading
16 broadly. Health care - Kaiser Permanente began a HRO effort in
17 its parenatal units in California and that's now spread across
18 the nation and is well documented, a huge energy company that
19 doesn't happen to be U.S. based and I'm not free to tell you.
20 It's huge, one of our largest energy companies.

21 Wildland and urban firefighting - the United States
22 Forest Service and the French wildland firefighters have a
23 program ongoing right now. And then there is an effort in the
24 U.S. State Department -- it's been introduced in the U.S. State
25 Department in the area of diplomacy, which I thought might be

1 kind of interesting for you to think about. That's an
2 interjectory effort.

3 So that's what I have to say about -- as an intro to
4 high reliability and I turn it over to my colleagues.

5 MR. NARVELL: Thank you, Dr. Roberts.

6 So, again, Mr. Chairman, with your permission we'll
7 proceed with Mr. Carnes.

8 CHAIRMAN SUMWALT: Absolutely. Thank you.

9 MR. NARVELL: Mr. Carnes, please.

10 MR. CARNES: Thank you. Good morning, Mr. Chairman,
11 members of the Board. Again, I'm Earl Carnes with the U.S.
12 Department of Energy.

13 I'd like to note that I'm here to share with you
14 today some application of the concepts that Dr. Roberts spoke
15 about as it relates to our work in the United States Department
16 of Energy.

17 I would like to note that my comments are not
18 intended -- I ask that they not be interpreted as taking any
19 position on the proceedings that the Board is undertaking here,
20 so thank you with that.

21 CHAIRMAN SUMWALT: Duly noted. Thank you very much.

22 MR. CARNES: Thank you so much.

23 Dr. Roberts talked about what an HRO is. Let me
24 start by taking about the impact of high reliability right off
25 the bat, and to do that let me turn to my experienced -- the

1 experience of our colleagues in, first of all, the commercial
2 nuclear power industry since I am a liaison and come from that
3 background, and let me share with you the actual experience of
4 key indicators of performance including safety over the past
5 some -- between 25 and 30 years, since 1985.

6 You recall there was an accident at Three Mile Island
7 nuclear reactor in 1979. Since that time the industry has been
8 working consistently, as Dr. Roberts said, on what are now
9 called high reliability practices. Let me share with you four
10 indicators quickly.

11 If you will look at the green line, which is the
12 lower line, it's entitled Significant Events. That's a formal
13 term with our regulator, the U.S. Nuclear Regulatory
14 Commission. The significant point without going into detail
15 there is look at the trend. A significant event is something
16 that has safety significance that you don't want to happen.
17 The point is over time with consistent application we've
18 reached the point today where those occur extremely rarely.
19 Okay.

20 The second line I'll call your attention to is the
21 blue line right above that. That's titled RX, which is not
22 prescription, but reactor trips, which does not make for a good
23 day. What it means is that our equipment somehow is out of
24 line and our automatic systems automatically shut them down.
25 That's a good thing. The thing that you don't want is for your

1 systems to be out of line. So we call that, you know, a safety
2 issue, again the point being we've reached the point today, not
3 that it is zero, but that that also is approaching zero.

4 The other two lines, first of all, the orange line,
5 stands for cost, cost for kilowatt hours. Just like when you
6 get your electrical bill at home you're billed in terms of
7 kilowatt hours. The significant factor there is note that the
8 trend line on cost is down, considerably down, over the years,
9 which means we're producing it a lot more effectively, a lot
10 more cost efficiently, the electricity.

11 Then the large yellow area is called Capacity Factor
12 and what that is is -- envision, you know, a plant -- you
13 designed a plant to -- well, let's say it produces a thousand
14 megawatts. When you run it to its maximum capacity that's a
15 thousand megawatts, 24 hours a day, 7 days a week, 365 days a
16 year. One hundred percent capacity is running all the time
17 maximum. Well, that really is not feasible because you have
18 maintenance and issues like that, but note that over time we
19 are now approximately 93 percent of maximum capacity throughout
20 the United States.

21 The point I want to illustrate is the practices that
22 we call high reliability practices get us improvements in
23 safety, improvements in equipment performance, improvements in
24 financial performance. The same practices principles improve
25 us on all levels. That has been our experience in that

1 particular industry.

2 Allow me to turn next to the Department of Energy if
3 you will. This -- and I would tell you there are a lot of
4 other statistics I could talk about in the commercial nuclear
5 power industry just as there are many others we could discuss
6 with the Department of Energy, but I bring these since the
7 previous slide was system safety and system performance. This
8 is the safety of our people that I'm illustrating here, so I've
9 titled this Worker Safety Statistics. It's basically your OSHA
10 reportables that we're talking about but without going into the
11 details.

12 Again, let me emphasize. You see up there that I
13 show a line going back to about 1996, and that shows when we
14 implemented our first mandatory application of high reliability
15 concepts in the Department of Energy. I simply want to draw to
16 your attention that since that point our worker safety
17 statistics have been improving significantly year by year.

18 I noted that -- again, I want to emphasize that while
19 these are outcome measures, these are not the only measures
20 that we track. We have an extensive system and system of
21 systems, as Dr. Roberts mentioned, of metrics and metrics
22 designed specifically also to get to those latent conditions
23 that Dr. Roberts mentioned, but because we also are concerned
24 with worker safety I wanted to reflect these performance
25 metrics to you also.

1 So now let me turn to application if I may. Let me
2 start with this. We started with this in the Department of
3 Energy and every organization that I know who goes down this
4 path has to start with this as a fundamental. We talk about
5 the old way of thinking versus the new way of thinking.

6 The first thing we have to confront is this
7 methodology of human error. In the olden days when we had very
8 simple systems we could say with some assurance that a human
9 action may have caused an event. That is no longer the case
10 and has not been the case probably since the 1940s because
11 today we're dealing, as all of you know, with very large
12 complex, multidisciplinary organizations and very complex
13 technological systems. We refer to them sometimes as complex
14 socio-technical systems.

15 The old way of thinking is to say that human error is
16 a cause -- and let me change that, the cause, the cause of
17 accidents. Today that's not true. It is involved, but it's
18 not the cause. The new way of thinking is that human error is
19 a symptom of trouble deeper in the system, and that is a
20 attitudinal shift that is necessary for people to really
21 understand how high reliability organizations can function.

22 Let me -- we approach high reliability in DOE in a --
23 from, first of all, a set of principles and, secondly, as Dr.
24 Roberts said, a system of processes to implement the
25 principles. Let me touch upon the principles and then I'll

1 just reflect briefly on the processes, but this is an important
2 distinction.

3 This comes from the literature -- Dr. Wach (ph.) and
4 Dr. Sutliff (ph.), who are colleagues of Dr.
5 Roberts, put it this way. Three of the principles are to help
6 organizations anticipate and be aware of the unexpected. Okay.
7 We can only know what we know, but we've got to really focus on
8 what don't we know. Let me touch on these briefly.

9 The Chairman yesterday or day before yesterday
10 mentioned this idea of preoccupation with failure, and what
11 this means is we have to be aware that there's only certain
12 things that we can know. Because our organizations are so
13 complex we have to constantly be asking ourselves at all levels
14 what could go wrong today, and if it did go wrong today, what
15 would we do to keep ourselves safe, our mission safe, our
16 customers safe. Okay.

17 The second one is reluctance to simplify. This is
18 hard because our organizations are complex. We have many
19 experts in our organizations. Our technologies are complex,
20 and as people we tend to try to go for the simplest answer. An
21 HRO doesn't. An HRO appreciates the complexities of the world
22 in which we live and tries to understand the full complexity.

23 The next one is sensitivity to operations, and what
24 this means is yes, there's a lot of things that are involved
25 and there's a lot of environmental factors, particularly as you

1 get higher in management, that you have to deal with, but it is
2 important that we all be grounded in the technologies that we
3 operate, design and run. It is important that we understand
4 how work is actually done in our facilities, which sometimes is
5 different than what our paper says, so the grounding in
6 operations by everyone in the organization is essential.

7 I'll make a particular note, if I may, to illustrate
8 that, that back in the commercial nuclear power world that
9 everyone from the very beginning entry person to our executives
10 in the organizations, to our boards of directors, are all
11 trained in similar concepts, HRO.

12 I will also tell you briefly that even within our
13 organization we have training that cuts throughout the board
14 including our senior executives here in D.C., and actually this
15 board, NTSB's vice chair, has been kind enough to come and
16 speak as a guest speaker at our senior executive training so we
17 can give them information and knowledge about these concepts.
18 It's extremely important.

19 The second two principles real quickly are the idea
20 of being committed to resilience. Again because things are
21 uncertain we have to be asking ourselves what could happen and
22 if it happens how would we manage it. Okay.

23 So commitment to resilience, and the final one is
24 deference to expertise, a very important concept. We train,
25 qualify and keep qualified every person in our organization.

1 We have so many different disciplines involved that no one can
2 know everything. So expertise is not a function of your rank.
3 It's not a function of how high you are in the organization.
4 It's a function of what you know. And so the skilled
5 management team particularly, but everyone in the organization,
6 is focused on finding the people who have the right knowledge
7 at the right time to apply to the issue to be addressed.

8 So those are the principles. Those have to be
9 translated then into our actual business processes. I'm not
10 going to go into detail because Dr. Roberts mentioned those. I
11 will say -- I will reflect on some of the work that Dr. Roberts
12 and her colleague Dr. Bee did. They focus on the importance of
13 the human -- understanding the human factors, understanding the
14 -- focusing on processes for the systems, our organizational
15 systems, and very important, for organizational learning. So
16 those are key processes to implement the principles.

17 Now let me turn specifically to the U.S. Department
18 of Energy. Oh, and just briefly if I may for those of you who
19 may not know, of course, we are an executive agency. We have
20 approximately 150,000 plus people. The majority of our work is
21 done by contractor partners which may be major universities,
22 may be organizations like BMW and so forth, but world-class
23 partners. We do everything. Of course, we have responsibility
24 for our nation's nuclear defense, as Dr. Hartley will be
25 talking about. We have the honor of having sponsored the work

1 of more Nobel Prize winners than all of the federal agencies
2 combined. We do cleanup of our nation's legacy, environmental
3 issues. That's heavy construction like construction. We do
4 biological work. We do next generation Internet work. You
5 name it, if it's hazardous we've got it. We have to manage it,
6 nano-technology. The point being that we started in that line
7 I showed you in 1996 saying we recognize the diversity of what
8 we do, but what we do is so important that we need to apply --
9 we have to mandate and require high reliability practices of
10 everyone that does work for the Department of Energy.

11 Now, we use a different vocabulary. Some of us talk
12 about high reliability, but some of us use other terms. Our
13 term for what is required is Integrated Safety Management. It
14 is a management system that everyone uses in the Department of
15 Energy to do the work and it is the basis for all high
16 reliability improvement.

17 Very quickly, I talked about principles, that inner
18 gear, as our set of principles. The outer gear is the
19 processes or are the processes to which Dr. Roberts referred,
20 and notice in our conceptualization the principles drive the
21 functions. That's all I'm going to say about that, but to
22 illustrate that we start with that.

23 Now I want to caution you, don't be afraid of the
24 formula, those of you who don't use mathematics all the time.
25 I show you this to make two points. Number one is it's

1 important to talk to people about high reliability in the
2 language that you use in your workplace, which is different
3 than the language that I may use in my workplace. I put this
4 up because much of our work is with scientists and with
5 engineers and they speak in mathematics, so we will speak to
6 them in mathematics. You know, for somebody else -- so I'm
7 going to explain these terms to you, so don't be confused by
8 that, please, but I do it to try to make a point.

9 Where we're talking, let's say, with construction
10 workers I would never put that up. We talk more about doing
11 work safely. Now this equation says the same thing to
12 scientists and engineers, but in talking with heavy equipment
13 operators I'm talking about what does it take to do your work
14 safely. That they understand. Okay? Now let me break down
15 that little equation because it's very simple concepts, but
16 very important and will be the next three slides that I talk
17 about to conclude.

18 The expression RE has to do with this idea of human
19 error and it says that we will never eliminate human error,
20 we're just human beings, but what we can do is understand error
21 and minimize the frequency of error. That's number one.

22 Number two, MC, has to do with our controls, our
23 safety defenses or controls, and what we want to do is
24 understand those or maximize the effectiveness of those
25 controls. That thing called Delta or triangle W, called Delta

1 W, stands for work as imagined versus work as is done, and what
2 it means is we do the best we can to develop plan, policies,
3 programs and procedures to guide work in the workplace, but
4 those may not always exactly duplicate the conditions that
5 people have to work under.

6 Now the idea is we want to keep those as much in
7 alignment as we possibly can because we do not want
8 instructions telling people to do work one way and then the
9 environment causing them to do work the other way. Okay. That
10 causes a problem. So we want to keep, let's call it our
11 procedures, and our actual work conditions online as much as
12 possible, and that again is collective responsibility of high
13 reliability. So we provide people with tools in all of these
14 and, of course, what we'll do is approach no events. Okay.

15 Let me show you this, that reducing error -- we've
16 done analysis and other people have done analysis of what we
17 call error precursors. There are cues, there are clues, in our
18 work environment that tell us that certain things could cause
19 us problems today. We want to analyze this knowledge and use
20 this knowledge to say look out for what's going on in your
21 workplace today where we're doing work packages, where we're
22 doing our pre-job briefings, and actually sensitize people to
23 what could go wrong. This is one way we do that.

24 The second thing, that maximizing controls or
25 defenses, I know this is a bubble chart. It's supposed to

1 portray the complexity, the real complexity, that we work with.
2 We have all kinds of defenses that we build in. We want to
3 make sure that we build the defenses based on our understanding
4 of the hazards and the work that we do. We want to maintain
5 those defenses and we want people to understand those defenses,
6 how they're supposed to work, and constantly question what are
7 my defenses today, how do I know I can rely on them and what
8 did I learn today that I need to feed back in to make sure
9 those defenses are working.

10 And then the final slide which has to do with this
11 idea of work as imagined or versus work as done is that what we
12 know from the events that we've looked at is that over time all
13 organizations change. We set out with the best intentions and
14 the things that make us successful today because the
15 environment changes may not work in the future. We want to be
16 constantly monitoring the environment because when we go from
17 -- we know, for example, my world in commercial nuclear power,
18 when we go from construction to startup we're going to a very
19 different world. We have to change the way we think and the
20 way we operate. As we go along and facilities age we have to
21 change the way we think and the way we operate, as our funding
22 patterns change. All those things can set us up for failure
23 unless we understand what's going on so that we call it the
24 Icarus paradox. If we're not constantly monitoring and
25 understanding how our environment is changing, how our

1 equipment is changing, how our people are changing, then we may
2 be doing things today that could cause us problems tomorrow.

3 Those are my comments.

4 MR. NARVELL: Thank you, Mr. Carnes, for your
5 presentation. And last, but not least, Dr. Hartley, please.

6 DR. HARTLEY: Thank you, Mr. Chairman, for allowing
7 us to come today to kind of share our experiences on this -- I
8 would call it a journey on high reliability, and let me, first
9 of all, kind of put into context why this is so important for
10 Pantex.

11 Most people don't understand what Pantex is. Pantex
12 is the nation's only nuclear weapon assembly and disassembly
13 location in the country. We have a very important role as far
14 as supporting the U.S. nuclear deterrent, and any incident what
15 would occur at Pantex would effect not only a local economy but
16 also national economy because about a third of the beef of the
17 United States comes through Amarillo and, like I said before,
18 if Pantex fails as being the only nuclear weapons facility the
19 nuclear deterrent of our country also will fail.

20 Now in addition to doing nuclear disposal work we
21 also fabricate high explosives, probably the most energetic
22 high explosives in the world, and so we have some very high
23 consequence type of operations that we maintain at Pantex, so
24 the concept of being high reliable is of utmost importance to
25 us.

1 And I'd like to start my talk off with this little
2 quote here from John Gardner. I'll give you a few seconds to
3 read it. And I present this here, and this is typical of most
4 organizations, it's not that we can't solve our problems.
5 People in organizations have been solving their problems for
6 hundreds of years.

7 CHAIRMAN SUMWALT: Excuse me, Dr. Hartley. For those
8 of us from South Carolina we need more than a few seconds. I
9 tell you what --

10 DR. HARTLEY: I'm sorry. You got it, sir.

11 CHAIRMAN SUMWALT: Okay. Would you just like to read
12 this line for us?

13 DR. HARTLEY: Sure. I sure will. And I apologize,
14 I'm from New Jersey.

15 Most ailing organizations have developed a functional
16 blindness to their own defects. They are suffering not because
17 they cannot resolve their problems but because they cannot see
18 their problems, and I cannot tell you how often we've seen that
19 not only with our own organization but many other ones. We all
20 have the ability to solve problems if we can see the problems.

21 Now as Karlene mentioned here, we all have --
22 starting to reframe the definition of high reliability, but
23 they all go about the same kind of primary constructs here, an
24 organization that repeatedly accomplishes its high hazard
25 mission while avoiding catastrophic events despite the fact

1 that we have various consequential hazards, very dynamic tasks,
2 time constraints and very complex technologies, and I would
3 venture to say that definition probably fits 90+ percent of
4 industries in the United States.

5 The one thing that we have learned, often painfully,
6 is that the way to become highly reliable is to learn from our
7 mistakes, and I don't mean learning as individuals, I mean
8 learning as an organization. So the concept of being a
9 learning organization, that is getting the average IQ of the
10 organization with regards to safety at a higher level, because
11 the idea here is you never know who's going to be challenged
12 with an error or potential for an error that caused a
13 catastrophic event so that whole plant has to be raised as far
14 as their awareness of safety. And a key component of being a
15 high reliability organization is in our regards here learning
16 from small mistakes or what we call information rich events
17 before we have the large event, and because of that we built a
18 complete process which I'll discuss later on, doing a root
19 cause analysis, trying to understand when we have a small
20 event, like Earl mentioned before, what organizationally set
21 those people up for failure that could impact the whole
22 organization in the future.

23 Now people often ask why is it so important to be a
24 high reliability organization, and I will give you a few
25 seconds to read this and then I'll talk about it.

1 Some type of systems failures are so punishing that
2 they must absolutely be avoided at all costs. These classes of
3 events are seen as so harmful they could disable the
4 organization, radically limiting its capability and capacity to
5 pursue its goal and could lead to its own destruction. I can't
6 tell you how important that quote is to Pantex. If Pantex
7 fails, this country can fail.

8 Now typically a lot of organizations have had the
9 fortunate -- been very fortunate at having very good safety
10 statistics, and Earl mentioned before about the safety
11 statistics within the Department of Energy improving since 1996
12 with the implementation of innovative safety management, but
13 this success could lead or could be the Achilles' heel to
14 failure because typically organizations are composed of humans
15 and typically humans when things go right they start to relax.
16 And so the biggest probably thing to watch out for as far as
17 being a highly reliable organization is complacency because
18 when things start going well, when your safety statistics start
19 improving, you start to think that maybe I understand how to
20 control safety, and as soon as you start doing that and you
21 start believing your own press you're on a slippery slope to
22 failure.

23 Now let me share an example of this. I'm sure this
24 picture here has been burned into your memories on January 16th
25 of 2003 when the NASA Columbia destroyed itself on re-entry

1 killing seven astronauts. Their OSHA recordable rates, total
2 recordable accidents or TRCs, was 600 percent better than the
3 DOE's that Earl showed you before, 600 percent better than
4 DOE's were at the time. Yet on launch day they waive over
5 3,000 critical types of events there that could lead to the
6 Challenger Columbia's demise. So 3,000 events -- and this is
7 in regards to examples like the phone breaking off and hitting
8 the wings of the Columbia. That became so normal to them that
9 they were waived on a routine basis. And a very good quote
10 from the Columbia Accident Investigation Board or the CAIB was
11 that the unexpected became the expected, which then became the
12 accepted, again complacency at its highest.

13 Now let me kind of share some history here. This is
14 a short list of various types of systems accidents that
15 occurred over the world since about the 1979 timeframe starting
16 with Three Mile Island. And one thing you see here that
17 continued to occur and the consequences thereof are phenomenal,
18 the amount of people who were hurt or killed and amount of
19 damages as far as economic damages are concerned and, for
20 example, Three Mile Island almost became the death of an entire
21 industry based upon one single event.

22 Now one thing we tried to do -- and I'll also put up
23 there, by the way, I had the last one up there, it always
24 brings people to understand what the consequences really are.
25 Look at the '08 timeframe, the stock market crashed. I would

1 venture to say that impact had impact on everybody in this room
2 and everybody in the world and it's a classical case of a
3 systems accident that we weren't expecting to occur with
4 phenomenal consequences.

5 So the question that we typically pose here is what's
6 next, and probably more important for people like Pantex who's
7 next? We do not want to have our name on that list. And
8 because of these types of consequential events that occurred
9 over time there have been many researchers, Dr. Roberts being
10 one of them, who has tried to understand what is that
11 organization behavior that leads to these fatal accidents. And
12 the idea here is by understanding those behaviors perhaps we
13 can find those things which we've got to guard against in our
14 organizations to prevent these kind of accidents from occurring
15 to us, so let me kind of share with you our journey at Pantex.

16 Like I said before, we are a manufacturing facility.
17 We take apart and put back together nuclear weapons for the
18 Department of Defense because the idea here is nuclear weapons
19 cannot sustain themselves in a stockpile forever. They must be
20 brought back, must be put new parts onboard, made safe for the
21 long term before they go back to the DoD.

22 Now I will tell you because we're a manufacturing
23 facility we're not a high tech research institute. We're very
24 practical people, very mechanically minded, just to get the job
25 done. And so based upon this the struggles we had was there's

1 lots of literature out there that would characterize or provide
2 traits of high reliability organizations. Our problem was how
3 do you become one, not what you look like, but how do you
4 become one, and both Karlene and Earl mentioned the fact that,
5 you know, the whole concept of high reliability is having a
6 system of systems.

7 And so we thought that Dr. Demming (ph.) here in his
8 theory of profound knowledge which sounds very complicated, but
9 it was very simple. Dr. Demming said if you're going to apply
10 a systems approach to avoiding consequential accidents,
11 understand what the system does for you, but also understand
12 the complications that system brings to you. It's much
13 different working as a collective group than an individual
14 group.

15 So we used Dr. Demming's theory of profound knowledge
16 to try to build a process that would help us attain these
17 attributes of high reliability organizations, and I'm going to
18 share with you these four tenets that Dr. Demming came up with
19 and show you how we applied them in our particular process.
20 Again, our process is focused on being very practical, very
21 simple because we found out if it's complicated and detailed it
22 won't work in the long term. It's got to be very simple for
23 people on the shop floor to understand and to implement it
24 consistently.

25 The first tenet of the theory of profound knowledge

1 is knowledge of systems. Again, understand you have got to
2 take a systems approach and, like Earl mentioned before,
3 everybody is prone to errors, typically about five errors per
4 hour. If you cannot afford for people to have a perfect day
5 every day, you had better put a system in place to catch them
6 when they make those errors because they're going to be made no
7 matter what. So understand the value of the system, but also
8 understand that system brings complications along with it.
9 It's much different working with a team of soccer kids than it
10 is one individual child.

11 Tenet Number 2, knowledge of variation. Know full
12 well that every system in the world is based upon using people.
13 People don't always follow the instructions perfectly every
14 day. Understand, as Earl mentioned, the difference between
15 work as imagined and work as done and be able to control or
16 reduce that very ability.

17 The third tenet is knowledge of psychology. The idea
18 here is our organizations are made of people. The collective
19 behavior of people is simply culture. That culture will either
20 help you become a high reliability organization or it will keep
21 you from ever getting close, so you must understand the culture
22 of reorganization to help you along the way.

23 And the last one is knowledge of knowledge. The
24 bottom line here is management is nothing but theory and
25 prediction. Understand what your system works -- what parts

1 work, what parts don't work, and modify the complete system as
2 you go through.

3 Now let me go through and apply these or show you how
4 we applied these to our particular practices, and all I'm going
5 to go is overlay our practice on top of Dr. Demming's and
6 explain each one after the fact.

7 The first one here is -- again, Practice Number 1 is
8 manage the system not the parts. Everybody has got to work
9 together collectively in order to protect against that fatal
10 error. Practice Number 2, reduce the variability nature of the
11 system. Number 3, foster a strong culture of reliability,
12 again focused on not only safety but also getting the job done
13 effectively. And the last one is learning and adapting as an
14 organization. Let me go over each one.

15 Practice Number 1, manage the system not the parts.
16 This is what we call the managers box. If the managers don't
17 bind this process, it is absolutely dead on arrival. The first
18 thing that management must do is ensure the system you put in
19 place actually delivers the goods. If it's a safety system,
20 quality system, financial system, if the system does not work
21 in its perfect sense, it sure won't work when workers get
22 involved.

23 Then go and manage the system and evaluate the
24 variability, foster this culture of reliability and model
25 organization learning which are the next three boxes that we're

1 going to talk about. So, again, if management doesn't bind
2 this process, this process goes nowhere because I'll tell you
3 in heartbeat workers can sense real quick if there's no
4 sincerity involved it's a flavor of the day and it just won't
5 go anywhere.

6 Practice Number 2 again is reduce the variability.
7 The best system in the world doesn't do you a bit of good if
8 you don't deploy it. So the idea is get out there, make
9 something practical and try it out. And as you do that
10 evaluate the variability because I guarantee you the people
11 won't follow the process the same way every day. There's
12 always variability involved. Understand it's different than
13 work as imagined versus work as done, and you go through adjust
14 the processes accordingly.

15 Practice Number 3, again if you look at the first box
16 it says you as a manager have assured us the system we have put
17 in place will work. If it's a safety system you don't want
18 people walking outside that safety envelope without thinking
19 very hard about it. You want them to make conservative
20 decisions. The system will provide safety if you stay within
21 the system. If you're a worker on a shop floor and you've got
22 to make a call on a particular case, we want you to make that
23 call using the best judgment possible, not to go outside that
24 safety basis. We want people to make judgments based upon
25 reality. And a normal example I use here is if you're in an

1 airplane, a two-engine plane, and both engines flame out and
2 you look up in the cockpit and the guy's reading the How To
3 Manual, you are in bad luck. We don't want people reading the
4 How To Manual on the shop floor. We want the expert. We want
5 the people who've done this thing 10,000 times. Those people
6 know what to do and those people have got to be able to get the
7 capability to practice and do real work so that they make the
8 right kinds of calls.

9 And the last thing is because this system is all
10 based upon physics -- that's the fundamental process we put
11 together. This is a physics-based safety program. If you
12 violate physics, safety will let you know about it. And so the
13 idea here, the worker on the shop floor knows more about this
14 process than anybody else. We want them to openly, and I mean
15 sincerely openly, question the system. If they find anything
16 wrong we have got to fix the problem because any type of
17 measurement cover-up or you want things just to go away are not
18 going to happen. If you violate the physics of safety it will
19 let you know.

20 And the fourth practice here is learning and adapting
21 to the organization. Again, now you want to understand how the
22 system in total is working with the idea in mind to go back and
23 modify the system as required and refine the system which you
24 have put in place.

25 Now as I said before, we put these practices together

1 and I will tell you these practices are based upon the research
2 that Dr. Roberts has done for many, many years and the idea
3 here is if we don't understand how organizations work we cannot
4 effectively apply the technology to make sure we optimize that
5 process, so everything here supports all the research on high
6 reliability.

7 The challenge we had as we through and studied this
8 research, here again, as I said before, we're not a high tech
9 facility. We're a manufacturing plant. And so we struggled
10 with how do you assimilate all the information out there and
11 literature and make it practical for managers who are extremely
12 busy and got to get work done. So we developed our own HRO
13 guide, which we have put copies together, and the bottom line
14 is it goes through and talks about the research that Karlene
15 and her cohorts have done over the years to help people
16 understand what's this high reliability concept all about.

17 We've also gone through and tried to characterize
18 those attributes of organizations called normal accident types
19 for organizations because these are the kinds of attributes
20 that you do not want to have. If you go back and review the
21 Columbia Accident Investigation Board Report that Karlene
22 mentioned you'll see the concept of normal accidents. You'll
23 see them in play at NASA a lot during that timeframe. When you
24 see these types of attributes in your organization, if you have
25 a high concept operation you should be deathly concerned, and

1 we've put these together. We want people to be aware of these
2 kind of attributes to avoid them.

3 We put together a logical framework. My now sense is
4 those four practices we mentioned before are pretty simple
5 practices, but we don't show our people on the shop floor those
6 practices. We have a very, very practical six-step process
7 that we go through all based upon logic and mechanical people
8 just understand that so well. Typically they finish our
9 sentences for us because they understand how this process
10 works. And the whole idea here, we want to frame this process
11 in their frame of reference, not ours. They're the ones who do
12 the work. They're the ones that need to understand. They're
13 the ones that need the challenge.

14 We also go through and try to understand how
15 organizational accidents occur because, like Earl mentioned
16 before, if we don't understand the root cause of these things,
17 it's not the work causing the problem, it's the organization
18 allowing the worker to cause a problem which we've got to get
19 to, and we use this to conduct what we call a Causal Factors
20 Analysis or CFAs which is basically a root cause analysis
21 process because, again, we want to learn not only what
22 occurred, we want to understand organizationally what allowed
23 it to occur because that's the problem we're going to have. If
24 somebody trips and has a small error, if we don't fix the
25 organizational problem somebody behind may trip and cause a

1 very large error, and that's what we cannot afford.

2 So our companion book here on Causal Factors
3 Analysis, again, it puts very sophisticated tools together.
4 It's a very systematic process, a very laborious process to go
5 through. Typically when we go through these things here we
6 have a senior manager sign for every investigation. Typically
7 it takes between 4 to 6 weeks, 12 to 14 hours a day, going
8 through the particular process, very much like this process
9 right here, and people typically question why do you do these
10 things for such a small incident? Well, the idea here, it
11 wasn't the incident that was important, it's the organizational
12 factors that are important. So we'll take normal everyday
13 types of occurrences and spend six weeks investigating to try
14 to understand what is wrong with our organization to allow this
15 process to occur or this event to occur, and it's paying great
16 dividends right now.

17 And so I'd like to leave you with a little thought
18 here, and typically people say okay, Rick, we understand why
19 Pantex does this for. The consequences of an accident at
20 Pantex are phenomenal. We understand why you invest so much
21 time. But I would venture to say that if your organization
22 cannot recover from that consequence that you just actually
23 can't afford to have occur, then I think you gain a lot of
24 value in this whole concept of high reliability. It's a
25 phenomenal process.

1 And so what can you expect? The one thing that we
2 have started to really appreciate, to understand, everybody has
3 lots of things to do. Everybody has lots of requirements to
4 follow. There's some requirements if you don't follow that you
5 won't come back again. So the idea here is focus on the most
6 important thing. And I think Covey Hadwick (ph.) had a really
7 good quote. He said the most important thing is to keep the
8 most important thing the most important thing. And so the idea
9 here is there's some consequences in your operation which will
10 just devastate the people, your whole organization and maybe
11 even the country. You've got to focus on those big actors.

12 The other thing I would say does a lot of value, adds
13 a lot of value, is it really increases the value to your
14 customer because what you're doing, you're going beyond the
15 call of duty. You're not being compliant. You're striving for
16 excellence. And I would tell you our personal involvement
17 here, our daily site office at Pantex, fully supports this
18 process. The DOE in total totally supports this process, as
19 evidenced by Dr. -- Mr. Carnes here.

20 The other thing we're starting to see which is very,
21 very positive, we have a large union presence at Pantex and,
22 quite frankly, the union didn't trust the management. And so
23 when we had events occur, the typical thing was punish the
24 worker, and so you can probably imagine information wasn't very
25 forthcoming, but through this process here we've opened up and

1 showed ourselves as the managers and also the workers that
2 we're not out here for the workers, we're not out here to get
3 the workers, we're out here to understand the organizational
4 factors that set that worker up because that's the problem that
5 we've got to solve, and as a result the workers are starting to
6 come forward and really tell you the truth and that's kind of
7 scary because you don't know what's going on until they tell
8 you what's going on.

9 The last thing here and probably the most powerful
10 thing is the issue about empowerment and, again, I tell you
11 this process here is very physically based, very logically
12 based, and it's not a new process, it's not a new system. It's
13 simply a framework for people to think. And you'd be surprised
14 when you lay it out logically all of a sudden they go I get it.
15 And what that allows them to do, they understand what systems
16 we had in the past were, and I will you we have lots of safety
17 systems at Pantex. We explain in terms of logic that they
18 understand. You don't need a three-letter acronym. How we
19 make sense. And so what it does, it gives them the ability to
20 challenge. Like I said before, if they don't challenge what's
21 wrong it will bite us later on, so we've got to understand if
22 you see something wrong we've got to know that.

23 And then we turn around and now we say now it's your
24 responsibility to engage. This is not a spectator sport. This
25 is full contact football. You've got to roll up your sleeves

1 and get involved every day. Like Karlene mentioned, if you
2 don't it's a very hard process to sustain, but if you don't
3 sustain it every day you could end up having a fatal
4 consequence. And I'll end with that. Thank you, Mr. Chairman.

5 CHAIRMAN SUMWALT: Thank you. And, Mr. Narvell,
6 before I give it back to you, as a point of order the Chair
7 would like to enter these PowerPoints as exhibits, and so, Mr.
8 Dobranetski, we'll begin with the PowerPoint presentation from
9 Dr. Roberts, and so that will be Exhibit Number --

10 HEARING OFFICER DOBRANETSKI: It will be Exhibit
11 Number P6D.

12 CHAIRMAN SUMWALT: P6D as in Papa 6 Delta?

13 HEARING OFFICER DOBRANETSKI: Yes, sir.

14 CHAIRMAN SUMWALT: Thank you. The presentation for
15 Mr. Carnes will be --

16 HEARING OFFICER DOBRANETSKI: P6E.

17 CHAIRMAN SUMWALT: Papa 6 Echo. And finally Dr.
18 Hartley?

19 HEARING OFFICER DOBRANETSKI: P6F.

20 CHAIRMAN SUMWALT: Papa 6 Foxtrot. Thank you. Those
21 have been accepted and entered into the exhibits.

22 CHAIRMAN SUMWALT: And before I give it to Mr.
23 Narvell I want to thank you very much for those --

24 HEARING OFFICER DOBRANETSKI: Thank you.

25 CHAIRMAN SUMWALT: -- those very enlightening

1 presentations. Mr. Narvell?

2 MR. NARVELL: Thank you, Mr. Chairman. I'd like to
3 echo the Chairman's sentiments. I collectively thank you for
4 your very informative presentations. I do have a few questions
5 here and I'd like to just throw out that whoever would like to
6 chime in and respond to these or all of you, whoever you feel
7 would be the best to respond.

8 We got presented with a lot of information here today
9 in terms of the characteristics and components of a HRO. Could
10 you just kind of encapsulate for us the fundamental philosophy
11 inherent in an HRO? Anyone.

12 MR. CARNES: I would venture to put it like this. We
13 talk about an HRO that is an organization that is fundamentally
14 mindful. It's a term that was used by a colleague, Dr. Karl
15 Wycke (ph.) at the University of Michigan, and to me it's the
16 most important distinguishing characteristic. You take all
17 those principles that I talked about and Karlene talked about
18 and Rick talked about is we train ourselves, discipline
19 ourselves and, more importantly, create our systems to be as
20 aware as we possibly can be of everything that's going on in
21 our organization and asking ourselves if something is not going
22 right or something could go wrong and how do we prevent
23 something bad from happening. I mean at its heart to me that's
24 a difference in a reliable organization and a not-reliable.
25 We're always asking those questions and testing our systems to

1 see if they will work as we think that they will.

2 MR. NARVELL: Okay. Thank you. Actually, Dr.
3 Roberts and/or Dr. Hartley, would you like to add any comments
4 to that?

5 DR. ROBERTS: Well, one of the things that I think
6 along with mindfulness goes situation awareness which means
7 essentially that you're constantly looking over the situations
8 that you're involved in and making sure you're aware of what's
9 going on, and too frequently, as we said before, disheartened
10 employees will try to make that impossible to do. So at the
11 bottom of the system is that you need to have employees that go
12 along with the program and, more than that, that think it's the
13 right thing to do and then you avoid that problem and you can
14 have good situation awareness.

15 MR. NARVELL: Okay.

16 DR. HARTLEY: Yeah. I'd like to add one thing as an
17 engineer, and this is kind of a funny thing to do, but
18 typically as an engineer we think we put a process together
19 that people follow, and I guess what I would say what the HRO
20 process does, it understands the fact that these processes are
21 done by people. And basically what you do, you just simply
22 pull people into your process, and so you never deliver on the
23 shop floor what you think you're right in the office. It's
24 what people execute on the shop floor that you're going to get,
25 and that's really the safety that gets delivered. It's not

1 what you think you get delivered, it's what actually gets
2 delivered. So the whole HRO concept simply understands the
3 fact that there's no such thing as pure engineering. It's all
4 people engineering and you got to fold that in your equation or
5 the process won't work,

6 MR. NARVELL: Okay. Thank you. I'd like to move now
7 to a discussion of the four frequently cited components of an
8 HRO, and again whoever would like to -- feel more comfortable
9 responding, and I'll go down these. We'll come back
10 individually, extensive process auditing, rewards and
11 recognition, higher quality standards and perception of risk.
12 We'll start with the first, extensive process auditing. Could
13 someone expound upon that, please?

14 DR. ROBERTS: Well, I can tell you where it didn't
15 exist, at Barings Bank. Barings Bank failed miserably because
16 there was no process auditing or auditing of what this young
17 man was doing off in Singapore. And so that -- audit the
18 process, look constantly at the process, so you don't think one
19 thing's going on in your organization while all the while
20 something else is going on.

21 MR. NARVELL: Okay. Mr. Carnes?

22 MR. CARNES: Yes. Let me give you an example of that
23 because I think about oversight and independent oversight and
24 also things we call self-checking. But back when I was in the
25 commercial nuclear power world I worked doing management

1 consulting for start-up plants and we call trouble plants that
2 have been maybe shut down for safety reasons, so I went into
3 one particular shut down plant situation as one of the
4 managers.

5 And so the quality assurance organization was doing
6 audits, and so the first time they came around they had a
7 scheduled audit. That was relatively new and so the auditor
8 came in and said kind of sheepishly well, I've been out and
9 I've looked at something and I've found something and I guess I
10 need to tell you about it, something like that. And so I said
11 well, please tell me about it, and so I got the report and I
12 asked a few questions and I said great, thank you very much.
13 Now there are some things that are concerning me. Could you
14 possibly get some of your people to go look at this?

15 Now my point is I was trained that oversight and
16 inspection is a function that helps me, not that it's there to
17 punish me. Okay. Finding something wrong is a behavior that
18 we value. People that can find things that we don't know are
19 people that we value. We want everyone on the line to find
20 something that we don't know and bring it to our attention.
21 And so that's -- we look at multiple levels of oversight as
22 helping us, not as finding violations or giving us parking
23 tickets, and that's an attitudinal difference, but it is so
24 important in the way that we look at oversight and self-
25 assessment. Like Rick was talking about, constantly having

1 different people help us understand what's going on.

2 MR. NARVELL: Okay. Thank you. Dr. Hartley?

3 DR. HARTLEY: Yeah. I guess what I would -- I'd kind
4 of rephrase that in that one thing that's kind of very
5 important to us and going back to the concept of work as
6 imagined versus work as done is that managers have got to get
7 out on the shop floor and see real work. I mean all the audits
8 in the world, which typically implies paper audit, don't do you
9 a bit of good. Again, the worker does the work. The worker
10 provides safety. If you go out there once in a blue moon the
11 worker suspects you're watching. You got out there every day
12 they get very comfortable. They share with you what's working,
13 what's not working. It allows you to fix it. So the most
14 important thing is just simply get out on the shop floor and
15 watch the work.

16 MR. NARVELL: Okay. Thank you. Bullet 2 that we've
17 discussed here is rewards and recognition. Dr. Roberts?

18 DR. ROBERTS: Well, I think the most important one I
19 ever saw and let me tell you the story. I was doing night
20 flight operations one night aboard an aircraft carrier and was
21 watching F-14s and other planes being trapped on this carrier.
22 Suddenly all the lights went on. Some little guy on the
23 carrier, and I mean little to me, he was far away, told his
24 chief that a part was missing, and a part will do everyone a
25 lot of damage in an airplane if it gets ingested into a jet

1 engine. And so all the lights went on on the ship and
2 everybody started looking for the part. Well, you can imagine
3 that turning all the lights on on a big ship like that is
4 relatively dangerous because the enemy can relatively know
5 where you are, not that it doesn't anyway, but this is just
6 more indicator of that.

7 So finally they found the part and the lights went
8 off, and the chief, the guy who was running the flight deck, a
9 commander or a captain, calls in a very gruff voice. He calls
10 the chief who was this guy's boss on the deck to the tower and
11 he calls the guy, and this guy, this little guy, 19 year old
12 guy, goes marching up to the tower with his chief, and I'm sure
13 both of them were going like this, and I was, too. I was
14 scared stiff that this guy was just going to get hung. Well,
15 can you guess what happened? He gets up to the flight deck and
16 the commander of the flight deck congratulates him for finding
17 the tool.

18 And there's an apocryphal story just exactly like
19 that out of Werner Von Bron (ph.). Some low level guy lost a
20 part in a missile and he found it and Von Bron congratulated
21 him. I think that's an apocryphal story. I don't know. But
22 the story I saw was anything but apocryphal. It really
23 happened. And I think that's the power of reward. Had the kid
24 gotten punished, he would have just sulked around all night
25 long and probably not done his job, but that's the power of

1 reward and I would definitely use reward over punishment when I
2 can.

3 MR. NARVELL: All right. Thank you. Mr. Carnes?

4 MR. CARNES: Yeah. Let me add something to that, and
5 I love those stories. We see those stories more and more. But
6 another thing, if you go around our sites you'll see coffee
7 mugs, you know, pens, pads, things like that. A lot of people
8 -- and you can see all kinds of consulting services that say,
9 you know, rewards and recognition. That's superficial. The
10 coffee mug is important, not for the coffee mug itself. It's
11 for what the coffee mug represents, and that to me is a
12 distinguishing feature of the HRO.

13 Yes, we give these little rewards and we have these
14 little competitions to learn to reinforce practices,
15 understanding, and the mug is not a mug itself. It represents
16 that I'm a member of a community, okay, and that communally we
17 are working toward these understandings and these
18 qualifications. It's like a badge of professionalism to have,
19 you know, a coffee mug this year or something like that.

20 So I just wanted to add that because sometimes we get
21 fixated on oh, we give a reward program to give somebody a
22 coffee mug and then, you know, that's what it about. That's
23 not what it's about. It's the symbol and what it means.

24 MR. NARVELL: Okay. Thank you. And then Dr.
25 Hartley?

1 DR. HARTLEY: Yeah. I want to answer it on two
2 different levels. One is a pretty high level and I'm going to
3 use a quote from Dr. Pete Wineger (ph.) from Defense Nuclear
4 Facility Safety Board, and his comment was -- and this kind of
5 goes to the organization itself, and his comment was just
6 follow the money. If you follow people with money, you realize
7 what their emphasis really is. If it's high reliability it
8 should be on safety and productivity. And if the money doesn't
9 match that, you know, they're not speaking the truth.

10 And the other one goes back to Karlene's comment, and
11 you'll find it's typically on most incident investigations.
12 It's this whole issue of trust, and again, if you don't have
13 this trust, workers won't bring the issues up to you. It takes
14 years to develop it. It takes two seconds to destroy it. And
15 typically on any of these investigations we have a tendency to
16 fall back on this blame the worker type of stuff, which is
17 extremely hard not to do because you just don't understand how
18 somebody can't follow a procedure that was written so well
19 until you get out there yourself and see how hard it is to
20 follow a procedure or typically you can't follow the procedure.

21 So again in the idea's mind is that the first time
22 you don't reward somebody or you actually punish somebody for
23 bringing something forward before they make a big mistake
24 you'll lose that trust and you'll lose all the information that
25 you have to have to be highly reliable.

1 MR. NARVELL: Okay. Thank you. Continuing on here,
2 item 3, higher quality standards. Would you comment on that?

3 MR. CARNES: Allow me to start if you will.

4 MR. NARVELL: Sure.

5 MR. CARNES: Let me again go back to the commercial
6 nuclear power world to make a distinction. After the accident
7 at Three Mile Island there was an intentional decision by the
8 industry, of course, encourage by all parties, that the
9 requirements are established by the Nuclear Regulatory
10 Commission. Rick mentioned this, that while meeting the
11 requirements is necessary, it is not sufficient for an HRO
12 because that's about excellence. And so that particular
13 industry committed itself at the highest level, the boards of
14 directors and chief executive officers, to developing their own
15 internal standards of excellence.

16 Compliance with regulatory requirements is minimum
17 acceptable performance, and unless one is always striving to
18 set standards of increasing excellence then you don't get what
19 an HRO is about. It's a set of self-imposed expectations that
20 transcend the minimum acceptable performance, and those
21 standards change every year based on who the best performers
22 are. That is a very, very high mark. As a matter of fact, at
23 the institute that I mentioned that I used to work for and
24 liaison with now there's a big stone pedestal in the common
25 area where the word excellence is chiseled into stone except

1 the final E isn't finished, and the idea there is that
2 excellence is never finished, it's an ongoing journey, and that
3 is to be part of how you live.

4 You know, we challenge ourselves in the Department of
5 Energy to always examining what our standards are. We
6 periodically revisit those. You have differing opinions on
7 that. But I just want to make that distinction between
8 regulation and standards of excellence.

9 MR. NARVELL: Okay. Thank you. Would any other like
10 to weigh in? No. Okay.

11 And the fourth and final characteristic we discussed
12 here a minute ago was perception of risk, which I think we've
13 kind of touched on briefly, but I'd like for you to expound
14 your remarks on that if you'd like.

15 DR. ROBERTS: Well, I actually think you have to
16 train people to be perceptive about risk, what are the signs.
17 We talk a lot about weak signals. Weak signals by definition
18 are weak signals. They're not very hard to -- they're very
19 hard to discern. So I think we have to train folks. We have
20 to say what would be a weak signal in this organization that
21 something's going wrong, what are your perceptual cues, and it
22 always helps if they're talking to each other because one
23 person will say well, I saw something down on the floor today
24 that looked a little odd and gee, I wonder about that, and the
25 next person will come along and try to define it.

1 But it's awfully easy to miss those things. I think
2 in our country that's why we're having so many health care
3 errors. We have -- we killed 90- to a hundred thousand people
4 a year in our health care system that didn't have to be killed
5 in the health care system anyway. And I think that very
6 frequently health care workers are for one reason or another,
7 and I don't want to case reasons here, don't pick up the
8 signals and they miss things, and that might well be true of
9 any other industry we can think of.

10 MR. NARVELL: I see. Thank you. Mr. Carnes?

11 MR. CARNES: Hazard identification, hazard awareness,
12 hazard control, that's common to anyone who's a safety
13 professional. But just to play off of what Dr. Roberts said,
14 what level -- you know, at what level do you identify something
15 as being a hazard? Let's just say that our experience has been
16 and the experience that we want to continue to have is that our
17 definition of what might be hazardous continues to be refined.

18 If you recall that slide that I showed that I called
19 error precursor --

20 MR. NARVELL: Yes.

21 MR. CARNES: -- it's one thing to go out and look for
22 a clear and present danger like an electrically energized
23 system, you know, a control tag that may or may not be present,
24 you know, something commonplace that most of us really
25 understand. It's another thing to go out and say okay, there's

1 a control tag on the system. I noticed that was there
2 yesterday. Maybe it was there the day before. I wonder if
3 that tag is still current. Let me check with someone. So my
4 point being there that we have a good organization and people
5 who are trained. It's a training and a mentoring thing to ask
6 more and more questions to get more and more refined in our
7 thinking of what might -- could be hazardous versus something
8 that is obviously hazardous. That's a different way of
9 thinking.

10 MR. NARVELL: Okay. Dr. Hartley?

11 DR. HARTLEY: Yeah, and let me cast mine at the
12 management level on the perception of risk. I'm going to go
13 back to this little phrase I had about the focusing on the
14 physics, and I guess what we say is basically it doesn't matter
15 what you think, it's what is. Managers typically mandate when
16 things get pressured and things have got to get gone just go
17 get it done, and they start to convince themselves that by
18 doing that -- and a lot of times they're very successful
19 because nothing happens and after awhile the perceived risk is
20 not a risk at all. Bottom line is they got lucky, and when you
21 violate the physics enough times the physics will let you know.

22 So the bottom line is it doesn't really matter what
23 you think is safe and not safe, it's what really is safe and
24 not safe. So the core foundation of high reliability, you have
25 got to have a very strong, very rigorous technical safety

1 program that's based upon the physics. Without that the other
2 constraints don't work, so we don't want to fool ourselves.
3 And it's all organizational behavior. There's a very
4 fundamental process here called in our case in re safety
5 management, the focus on the physics. And, again, it doesn't
6 matter if you don't understand. It's like having cancer, not
7 knowing about it. It doesn't make it go away. The earlier you
8 know, the more you know, the more you take into control.

9 MR. NARVELL: Okay. Thank you. Communications.
10 It's obviously to -- communications are an integral part of any
11 organization system, et cetera, and although I did not see it
12 specifically in your presentations, I'd like for the panel to
13 speak to what role, if any, do effective communications have
14 within the framework or context of an HRO.

15 DR. ROBERTS: A very big role. I think if all people
16 -- that's part of the problem when you have an accident. All
17 the people who should have been talking to one another weren't,
18 and that we see almost 100 percent of the time, so the left
19 hand doesn't know what the right hand's up to.

20 Now how do you get there from here? One way you get
21 there from here is we're in a world of specialization, and when
22 you get into a world of specialization where the finger surgeon
23 isn't talking to the heart surgeon, yet the patient has a heart
24 and finger problem, you can't get all the pieces together and
25 so we specialize, and we're doing this all over the place. I

1 think Toyota's a wonderful example of that. We're specializing
2 all over the place and we're forgetting to re-coordinate, and
3 the schemes I've seen recently for re-coordinating aren't very
4 good ones.

5 In hospital rooms the way they'll try to re-
6 coordinate the system of health care is they'll put a big
7 blackboard up and the last person -- since hospital rooms are
8 characterized by lots of people running through them -- having
9 just been in the hospital for 12 days, I can attest to that --
10 what you do is you put up a big whiteboard in the hospital room
11 and the last person in, whether it's a nurse or a nurse's aide
12 or somebody took the blood pressure, is supposed to write on
13 the board what they did and what the outcome was. Most of them
14 never write anything on the board.

15 Not that I think that's the way to coordinate. I
16 don't. I think it's a bad way to coordinate. I think people
17 should talk to one another. But that's the attempt to -- in
18 that situation to coordinate what they know has been
19 specialized treatment, and I think we have to be very, very
20 careful particularly in the organizations that these folks are
21 dealing with to re-coordinate and to develop strategies for
22 that re-coordination.

23 MR. NARVELL: Okay. Thank you. Mr. Carnes, would
24 you like to proffer an opinion?

25 MR. CARNES: Yes, and I'll try not to go on too long,

1 but I mean it is such an area. There's the communication, the
2 operational communication, as Karlene talked about of how we
3 interact with one another to actually do our jobs. And there
4 is very, very good literature, scientific work, like Karlene
5 and others have done that we try to base -- we try to base our
6 learnings and practices as much as we can on science as opposed
7 to just my opinion, okay?

8 So I go to some of the work that's been done again in
9 the hospitals that you mentioned, going at and looking at the
10 artifacts, as Rick said, the devices, the status boards, the
11 displays, understand there are many different ways to
12 communicate technical information and trying to understand how
13 those different ways are used.

14 Doing that kind of research and understanding is
15 characteristics of a highly reliable organization. That's one
16 point. So we really focus on understanding that, the teamwork
17 that you talked about. That's another way that we actually
18 analyze, research, think about, okay? We don't just allow it
19 to happen. We help people learn how to operate as teams
20 because those are skills that you don't just normally have.
21 It's like when you're playing baseball or football or whatever,
22 you have to be taught how to play on a team, okay? So we focus
23 on doing that kind of work.

24 The management interaction or the interaction at all
25 levels, we have to -- Rick talked about observations, which is

1 so important in this form of communication, but see, managers
2 are people, too. We forget that. Okay. They have to be
3 taught because they're usually technical people in our area.
4 They're scientists, they're engineers, they're, you know,
5 financial officers or something like that. They're not born
6 with good people skills necessarily. We have to teach them how
7 to go out and interact with the employees, to actually have a
8 conversation to say gee, what's going on here and how do you --
9 because a lot of times they don't do it because they're kind of
10 nervous, okay?

11 So my point being yes, your question is so important.
12 We have to as an organization, as organizational leaders, we
13 have to go out and analyze the many different ways that
14 communication can occur and needs to occur and plan that with
15 the same degree of rigor that we analyze and plan like an
16 engineering solution would be my observation.

17 MR. NARVELL: Okay. Thank you. Dr. Hartley?

18 DR. HARTLEY: Yeah. I would say, you know, this
19 whole concept of being a learning organization without
20 communication obviously doesn't work. And typically we think
21 about communications from the top down, you know, tell people
22 where we want to go and stuff like that, but, you know, the key
23 tenor here is to listen to the feedback from the shop floor
24 because they're telling you what's working, what's not working.
25 Typically if you're busy and have pressure to get schedules met

1 the last thing you want to hear is somebody telling you what's
2 not working on the shop floor, but bottom line is that's when
3 you need to listen more than anybody else because, you know,
4 again it comes back to work as imagined versus work as done.
5 If this process is going to work and you don't want to fool
6 yourself you must understand the gap between those two concepts
7 right there because what gets done by the workers is what gets
8 done for safety, not what you imagine.

9 MR. NARVELL: Okay. In your experiences what have
10 you seen that -- in terms of degrading or detracting from the
11 effectiveness of an HRO?

12 DR. ROBERTS: Well, I think a big one is lack of
13 resources. You can't do it without considerable resources and
14 things like training and other kinds of things. They're the
15 first thing to go in cutbacks. So you have -- and then once
16 you dedicate the resources to HRO you have to keep dedicating
17 the resources to HRO, so that's a big thing.

18 Corollary with that is what goes first in any cutback
19 is training, and Earl just talked the necessity of training
20 people to behave in such a way that they're opening up their
21 organization. Their organization is flexible and fluid. Once
22 you start starving an organization it gets rigid extremely
23 rapidly.

24 MR. NARVELL: Mr. Carnes?

25 MR. CARNES: Let me focus on this. While any -- I

1 believe my experience says that any change in an organization
2 starts with an inspired vision of what we could do differently
3 coming from one or more inspired leaders, that depending upon
4 individuals is no way to have a highly reliable organization.
5 It starts with individuals and individuals are always
6 important, but this has to become "institutionalized," part of
7 the culture.

8 Now I reflect on a lecture or presentation I heard by
9 -- I forget his name, but the chief financial -- excuse me, the
10 chief executive officer of Google and he talked about being a
11 classically trained, you know, MBA, how he goes into this
12 organization and he -- of course, he's supposed to be making
13 decisions because he's in charge, so that's what he's supposed
14 to do. He's in charge. He's making decisions. So he makes
15 his pronouncement as to how things are going to be and the
16 people say no, no, that's not the way we do things around here.
17 He says but I'm in charge and they say yeah, I recognize that,
18 but that's not the way we do things around here. This is our
19 culture, okay, so my point is that culture -- a positive
20 culture is the property of the organization and each and every
21 individual, okay, who is a member of that organization.

22 Yes, it starts with inspired leadership, but it has
23 to go further so that we have to be mindful of who are the
24 leaders at all levels and engage them to begin with. And then
25 as people are turned over, new people come in and all, how do

1 we engage them in the discussions. That's all my point of
2 trying to say that the biggest way for things to fail is to
3 invest responsibility for "high reliability" in only a few
4 people as opposed to understanding that you've got to design it
5 so that everyone understands that they are individually as well
6 as collectively responsible for creating this culture. We are
7 all a part of it. That's a key thing to me.

8 MR. NARVELL: Okay. And Dr. Hartley?

9 DR. HARTLEY: Yeah. I guess what I would say -- I'm
10 not sure this will detract or not, but I guess that the biggest
11 obstacle of becoming high reliability is being human. And it's
12 true because you think about that, as soon as things go right
13 you relax and you've got to fight that all the time.

14 Now with that being said, I would say the biggest
15 detractor are managers not walking the talk, and I would say
16 the managers probably have the toughest job in the world
17 because you got to do the management stuff, but you got to get
18 out there and lead the people, you know, manage it. There are
19 some things you manage, but people you've got to lead so, you
20 know, you've got to go out and do both. I know every day
21 you've got meetings to go to, you've got reports to write,
22 you've got to get that done because that's how you get judged
23 on your performance as a manager, but if you don't get out
24 there and watch real work things fall apart really quick.

25 And so the whole idea here is you have got to be a

1 super human being and not let that come into play with you, but
2 you've also got to encourage your people to do the same thing.
3 Even though you enjoy success for one day pat yourself on the
4 back once, not twice, because as soon as you do it a second
5 time you're starting to slip.

6 So the biggest thing is, I would say, managers
7 walking the talk. You've got to get out there because people
8 can see through you in two seconds if you don't really do what
9 you say you want to do. People see that and they'll stop
10 working very quickly.

11 MR. NARVELL: Okay. Thank you. Are there specific
12 training curriculums pertaining to HRO, and I believe that
13 there are, but would you be able to briefly describe and
14 summarize them? Dr. Roberts, we'll start with you.

15 DR. ROBERTS: Well, -- enough, we don't have one at
16 Berkeley, but what is happening nationally is that graduate
17 programs -- and my area is business administration. Graduate
18 programs in business administration, the nighttime MBA programs
19 and some programs like that are beginning to look at this
20 issue, so as a result of that Stamford University Press began a
21 series of books on high reliability organizing and has within
22 that -- and I'm the editor of that series, so within that
23 series it has now a couple -- it's first two books. So that
24 means by their discussion, not by mine, that they feel that the
25 area is opening up.

1 Now there are curricula, practical curricula, but the
2 one I know about -- most about is Lessons Learning Center (ph.)
3 which is in part supported by the U.S. Forest Service, and so
4 they're -- and I think many, many organizations try to get some
5 practical curricula in the organization, but institutionalized
6 into university programs is just beginning to happen.

7 MR. NARVELL: Okay. Thank you. Mr. Carnes?

8 MR. CARNES: Yes. Let me note related to that I've
9 provided exhibits, a two-volume handbook that we published out
10 of the Department of Energy. We refer to it as Human
11 Performance Improvement. It was offered into an exhibit here
12 for the Board hearing, which means it's available to any and
13 all who chose to use it as a basis for learning, furthering
14 your own education. There are tools in there that incorporates
15 material from the commercial nuclear power industry, chemical
16 aviation literature, so forth, so that is a resource that's
17 available to start with.

18 From that we in DOE have tailored various kinds of
19 programs, you know, referring to the human performance issues,
20 so we have -- we've developed training specifically, as I
21 mentioned, even for our Senior Executive Service people, deputy
22 assistant secretary level, for the first time back in the early
23 2000s that they ever had mandatory training, week long in-
24 residence training where they're actually tested, and all these
25 things that we've talked about are part.

1 We have other specialized areas like personnel and
2 security and so forth, but these are -- these concepts are
3 fundamental for the executive level training that permeates
4 throughout the organization with what Dr. Hartley did at the
5 management level at Pantex. We have what we call practitioner
6 training, human performance improvement. We have specialized
7 for human performance improvement for maintenance. We have a
8 causal analysis training that uses these concepts and how to do
9 causal analysis like Rick has for Pantex.

10 So we as DOE developed -- of course, we borrowed from
11 others. We went out and we benchmarked. We found out what the
12 nuclear industry's doing and so forth and borrowed, but we
13 developed our own curricula at a number of different levels and
14 that has spread throughout our contractor organizations and we
15 continue to do that kind of stuff. And I will say, you know,
16 on behalf of the Department of Energy, you know, these are
17 government created things and I'm, of course, very pleased to
18 share, but you always have to take it, customize it and tailor
19 it to your respective organization, but we do that. And then
20 we engage in the professional seminars that Dr. Roberts and
21 others throughout the country have and with our other federal
22 agencies, so those are the kind of things that we do.

23 MR. NARVELL: Okay. And now, Dr. Hartley, do you
24 have anything at Pantex?

25 DR. HARTLEY: I'm not very biased, but the best HRO

1 class you can get happens to be taught at Amarillo, Texas. Now
2 we actually teach our process here and try to tailor it for the
3 folks who want to show up, and so we teach this about four
4 times a year in Amarillo. We have gone to other sites and
5 presented this seminar and typically what we try to do is
6 understand what the organization's needs are and tailor it to
7 those folks right there.

8 We also teach our causal factors analysis class.
9 Again, it's kind of tied together. But, again, Amarillo, Texas
10 and those are available to anybody who wants to show up.

11 MR. NARVELL: Okay. Again, I apologize if this was
12 already presented here, but I'll ask the question. Is there
13 any mechanism or vehicle within the HRO framework that permits
14 the investigation of an accident or incident? Karlene?

15 DR. ROBERTS: Yes.

16 MR. NARVELL: Okay. Could you expounded up that,
17 please?

18 DR. ROBERTS: Well, I've looked at several major
19 disasters from an HRO standpoint, and some of the other people
20 who do this kind of work have, too. And, one thing, if you
21 have a major problem you can ask somebody from some
22 organization that's doing it as well to be an outside
23 investigator, and that's a very good thing to do because they
24 bring a different set of eyes and ears. But I don't want to
25 mention the specifics, but I've looked at a number of accidents

1 and said here's where an HRO didn't work, here's where it
2 didn't work, here's where it didn't work, here's where it
3 didn't work or did you ever think of it and most of them never
4 had.

5 By the way, I want to go back one minute to the other
6 question about training devices. We do at our little center --
7 and they're both familiar with it. We run specialized seminars
8 for organizations that want to do that and we do that as a paid
9 thing to do, and we pick out -- we have, I'd say, a Roladex of
10 people that belong to our center, affiliated with our center in
11 some way, and Earl's one of them, and we ask the organization
12 what it wants and what it wants to hear about and then we
13 tailor make seminars to that.

14 I was thinking when you asked the question of my own
15 bias, which is what's in a standard curriculum of teaching --

16 MR. NARVELL: Okay.

17 DR. ROBERTS: -- in a university, so -- but, yeah, as
18 far as organizations that have had problems, I'm sure all of
19 them looked at those.

20 MR. NARVELL: Okay. Mr. Carnes or Dr. Hartley, would
21 you like to weigh in on that?

22 MR. CARNES: Let me make one observation and then to
23 Rick, please, is that one of the challenges and things that
24 we're trying to do within DOE -- we've had a very robust
25 accident investigation program historically. Some of you who

1 are accident investigators know of the work techniques which
2 were developed at our laboratory at Idaho back in the old days,
3 so we have a long history of accident investigation.
4 Fortunately, we don't have a long history of severe accidents,
5 but we do have a long history of accident investigation. We
6 continue to refine it and collaborate with our other federal
7 agencies to learn from them and to share with them.

8 To say this, we are -- we have been working for
9 several years, five in particular, to get accident
10 investigations framed more in terms of HRO concepts. One of
11 the learnings that we are trying to learn is that our
12 investigators are highly qualified technical people,
13 scientists, engineers, health physicists, et cetera. The
14 reality is that not all of them can make the higher level
15 systemic organizational causal connections. Some can, some
16 cannot.

17 So one of our learnings is to start including someone
18 who really understands HRO, you know, as either being a board
19 chair or preferably advising the board chair, helping to frame
20 the recommendations at the broad systemic level as well as
21 cultural level, that that is a certain unique set of skills and
22 knowledge that not all accident investigation teams, as you
23 fully appreciate, and so getting more of those kind of people
24 qualified and populated as formal members, you know, of
25 accident investigation teams is something we're working on.

1 MR. NARVELL: Okay. Thank you.

2 DR. HARTLEY: Yeah. Because we are a DOE contractor,
3 if we ever have an accident, heaven forbid, we fall under the
4 DOE's accident investigation process. Again, our processes are
5 what we call information rich events. They don't meet the
6 criteria for accidents. They don't sit well with our concept
7 of high reliability, and that's what we go investigate them
8 for.

9 Again, we use this causal factor analysis process,
10 which again it kind of goes beyond the typical root cause. It
11 gets down to what Earl was talking about. We actually use the
12 HRO models that are tied together to understand what did we not
13 do right as far as being a high reliability organization, and
14 that's what we're trying to drive towards, to understand those
15 organizational factors, not the simple errors that humans make,
16 but organizational factors that set the workers up because
17 that's the problem we want to solve.

18 And, again, the idea is if you solve the
19 organizational problem which are endemic across the plant, then
20 perhaps you can prevent that systematic accident occurring
21 after the fact. Thank you.

22 MR. NARVELL: Okay. Thank you.

23 Mr. Chairman, this concludes my line of questioning
24 at this point. Thank you.

25 CHAIRMAN SUMWALT: Thank you. Mr. Gura?

1 MR. GURA: Good morning. First, I'd like to thank
2 you all for the very informative presentation and, Mr. Carnes,
3 I did attend that DOE work technique. I found it very
4 informative, too.

5 CHAIRMAN SUMWALT: Can we get a little more volume
6 for Mr. Gura, please? Thank you.

7 MR. GURA: This is what I'd like to talk a little bit
8 about. Railroads and transit agencies are very rule and
9 regulation based, and there's an old saying that the safety
10 rules in the transit and railroad industry were written in
11 blood.

12 When an accident or incident occurs it's very easy to
13 blame this accident or incident on a rule violation, and Dr.
14 Hartley kind of touched on that a little bit, and I could see
15 where, you know, the system can be involved in the root cause
16 for allowing that incident, but I'd like you all to kind of
17 weigh in a little bit on your thoughts on personal
18 accountability. And the personal accountability -- I'm going
19 to even give you an example, cell phones, okay? There's been a
20 rash of accidents of people using cell phones. There have been
21 rules written. People have been pulled out of service for the
22 use. There's people still being photographed using them while
23 they're operating. Where does personal accountability weigh in
24 in this HRO? And I would address that to the whole Board and
25 if you want to start, Dr. Hartley, and just work your way down.

1 DR. HARTLEY: Yeah. Personal accountability, I'll
2 use the cell phone example. Even at Pantex we probably take it
3 a little step further because of the type of work we do. We're
4 not allowed to bring any kind of devices onsite, so everybody
5 has a phenomenal responsibility there of making sure things are
6 checked at the front door, so to speak. But I would tell you
7 that, you know, typically people think about this concept that
8 Earl talked about, about not blaming the worker, understanding
9 what the organization is all about, and finding out why the
10 organization uses it as an excuse for workers not to follow the
11 procedures.

12 I would tell you that procedure adherence is kind of
13 the official terminology that we use. It's very, very strict
14 and stringent there at Pantex, as you'd hope is the case, and
15 so many times there we'll go through a basically accountability
16 kind of process here to understand did the worker simply fail,
17 and I guess the classical example there is that if you were to
18 find yourself having the same error based upon, you know, the
19 environment the worker worked in then perhaps that was a simple
20 error as opposed to a willful violation of the procedure, which
21 we don't tolerate whatsoever.

22 And so the bottom line is that we fully expect the
23 workers to follow the procedures because, again, the concept is
24 those procedures will ensure safety not only for the individual
25 but for the whole site, and we can't tolerate the variation

1 thereof. Okay. So I guess the bottom line is that then when
2 people say the process doesn't work or the procedure doesn't
3 work, well, your only options are to stop work, fix the
4 procedure, not violate the procedure, and without that kind of
5 personal accountability there the process will not work.

6 And I would say that the process has been working at
7 Pantex for many years, many years before even the concept of
8 high reliability came up to surface, so to speak, and a lot of
9 it's based upon the nuclear Navy concept which I'm sure you're
10 all familiar with. But bottom line is that people absolutely
11 must and are held accountable to maintain themselves within
12 that safety envelope by following procedures which are
13 established. And, again, if they don't think those procedures
14 are right, are not workable or not safe, it's up to them to
15 stop work, get them fixed before work begins.

16 MR. GURA: Yes, please. I'd like the Board to weigh
17 in on that response, and thank you, Dr. Hartley.

18 MR. CARNES: A few key thoughts to share. Forgive
19 me, I don't recall the author's name, but there's a phrase that
20 has stuck with me for a long time. It was a line that goes
21 something like this. Thou shalt not last but for a moment,
22 once upon a time last forever, the point being, to me, at least
23 my experience as a human being and observing other human
24 beings, is we don't relate that well to being told don't do
25 that. That's a power thing. However, I've been very fortunate

1 in my career to have been trained, educated, mentored, coached,
2 corrected, okay, all of those things that have helped me today
3 be a person who says oh, these requirements are here to help
4 me, these procedures are here to help me, they are my tools.
5 That is the culture in which I have been raised, okay, but as
6 just a natural human being I wouldn't react that way.

7 I say that to say this. Accountability is something
8 that is -- I believe accountability is something that is
9 volunteered, not something that is required. I must be a
10 person because of my -- part of my profession is to give an
11 account for what I did, why I did it, when I did it, because
12 that's part of my caring for my job and for my colleagues and
13 for my professional responsibility. But you can't require me
14 to do that. You can help me learn to do that.

15 Now it takes a long time to develop that kind of
16 culture. So once one is schooled and trained to understand why
17 those things are important, then we can expect people to live
18 up to those expectations, but I don't buy the idea of catching
19 somebody doing something wrong and saying oh, you should have
20 been accountable if I haven't done what I need to help them
21 understand why this is important to the point that they are
22 willing to take responsibility because they own that.

23 Now this is a long and difficult discussion which we
24 can't go through, but we use the idea of accountability
25 oftentimes as a scapegoat of punishing an individual, thinking

1 that's going to fix a problem, you know, for somebody else who
2 hasn't been trained and schooled and coached and mentored,
3 okay? So we've got that whole collective responsibility thing
4 of preparing a person to know that this is the right thing to
5 do or is not a correct thing to do. So that comes first.

6 Then if there's a repetitive behavioral trend that we
7 notice we have to correct it like Rick was talking about. It's
8 kind of chicken and the egg, which one came first. Prepare the
9 person to know and then look to see if they follow. That's --
10 I think you got the point. That's as far as I'll go on that.

11 MR. GURA: Thank you.

12 DR. ROBERTS: I'm going to take a little different
13 tact on the accountability issue. I think it would be a very
14 good idea for any large and old organization, particularly
15 large and old, to re-look at its procedures to which people are
16 to be accountable because some of them may be interfering with
17 safety and reliability. And, you know, aviation has done this.
18 Aviation's old enough now that the procedures that were
19 appropriate when the Wright brothers were hanging around are
20 not appropriate today. And so sometimes those things to which
21 you hold people accountable are out of date, shall we say.

22 Now another thing I would think -- I heard a ship
23 captain once say to a crazy bunch of 19 year olds follow the
24 procedures and the rule to the law except when they interfere
25 with safety and then break them, and I think that that's

1 something that should be looked at.

2 Now, of course, if you have -- if you've done that,
3 if anybody's done that, and they have a set of procedures in
4 effect which are necessary, as I think Pantex does, then the
5 accountability issue is absolutely imperative.

6 And I don't mean to say that HRO doesn't think
7 accountability is important. We've just seen accountability for
8 behaviors not very well thought through and other things done
9 like punishments that -- punishment will tell you what not to
10 do. It doesn't tell you what to do. It never has. So
11 punishment's put in place. So you punish some person for
12 behaving one way on the shop floor, but okay, if I'm that
13 person, now what do I do, so you have to include training with
14 punishment if you're going to use punishment.

15 So I think that's why we've focused on the other
16 side, is because we've seen so much in real organizations of
17 procedures that weren't really very useful, of calling to
18 account people for behaviors that had almost nothing to do with
19 the job at hand and things like that, so I take a slightly
20 different view, but I certainly resonate with my colleagues who
21 say, you know, you have to hold people accountable, but you
22 have to look through the whole system and make sure you're
23 holding them accountable for things that are important.

24 MR. GURA: Thank you very much. Mr. Chairman, that's
25 all I have.

1 CHAIRMAN SUMWALT: Thank you. Let me get a flavor
2 for how many parties will be asking questions, and I'm hoping
3 that there will be questions, but I'm trying to get an idea if
4 people are just in need of a physiological break. There's a
5 couple of -- tell you what, let's take a quick 10 minute break
6 and we will reconvene at about 3 minutes after 10. We are in
7 recess.

8 (Off the record.)

9 (On the record.)

10 CHAIRMAN SUMWALT: Okay. We are back in session and
11 we will begin with the parties, and today we will start with
12 the ATU.

13 MS. JETER: Thank you. There's been so many good --
14 so much good information, but one of the questions that I have
15 is that all too often I think in the transit industry we do
16 look at regulations and rules, and one of the conversations
17 that we had yesterday was concerning the need for more federal
18 regulations. My question is do you believe that federal
19 regulations should stop transit agencies from putting in
20 regulations on their own that may be -- either mirror those
21 regulations that the federal government will put in or those
22 that are better than the federal government? I know your
23 answer is going to be yes. Somebody --

24 MR. CARNES: Shall I bite to begin with? I think
25 you've heard -- and this is my personal sentiment based on my

1 experience.

2 CHAIRMAN SUMWALT: Let me -- I'm sorry. I was having
3 a hard time hearing you. Would you just repeat the question
4 for us, please?

5 MS. JETER: My question is the federal government is
6 taking into account a lot of regulations for railway safety and
7 transit, mass transit as a whole, so I'm asking do you believe
8 that there are better regulations that the transit
9 organizations can put in place that probably will enhance those
10 federal regulations or mirror those federal regulations?

11 CHAIRMAN SUMWALT: And here's what we want to know.
12 I think that that question, although I get the question, I'm
13 wondering if it's -- I'm thinking it's out of the scope of this
14 particular --

15 MS. JETER: Okay.

16 CHAIRMAN SUMWALT: -- panel because they are here to
17 focus on HROs, but if they can -- but if we can scope that
18 down.

19 MS. JETER: I understand what you're saying. If this
20 is out of their scope, that's fine. I can move on to another
21 question. That's fine.

22 CHAIRMAN SUMWALT: Thank you.

23 MS. JETER: And I'm trying to mirror my question so
24 that it's within the scope, but rules -- we talked about
25 accountability a few minutes ago before we broke, and my

1 question becomes when you have rules concerning accountability
2 should those rules be for everyone because when there's holes
3 in those rules or regulations or in that accountability process
4 individuals tend to break it more or look for reasons why they
5 can break it more, so should it just be a blanket rule for
6 everyone and not just for some?

7 MR. CARNES: If I understand your question, where my
8 mind was working is that a lot of the focus is on and has to be
9 on the process of how should things work, you know, because the
10 rule would tell me what the intent of the requirement is, but
11 then what do I do with that, and that's been a lot of our
12 focus, is management and organization, okay?

13 So within that context what we encourage being done
14 in our contractor organizations is a really good reflection, as
15 Karlene was talking about, on what are the personnel systems
16 and policies internal to the organization recognizing that
17 there are certain federal requirements and all that are there,
18 but the question is how does an organization make decisions
19 about personnel issues, and I'll hazard to use the word and
20 disciplinary issues, and that those systems be made -- created
21 very thoughtfully with the involvement of appropriate parties,
22 you know, in developing those particular policies and
23 procedures, that they be very transparent. And, frankly, we
24 encourage using the approach articulated by Dr. James Reason
25 talking about just culture, culpability mechanisms and things

1 like that in coming up with those kinds of policies and
2 carefully -- always evaluating them. And I don't know if that
3 gets to your question or not, but those are the approaches that
4 we're trying to pursue in DOE.

5 MS. JETER: And a follow-up to that because Mr. Gura
6 used the analogy of the cell phones and how that's become very
7 publicized as far as transit is concerned. So with that in
8 mind does it do more harm to put out a rule concerning a
9 publicized behavior and then have to retract that rule and put
10 out another one? Is it more harmful or is it -- should the
11 policy be to look at the culture, look at what's going on
12 within your agency, and then put out a rule?

13 MR. CARNES: I'll respond one more time. I said I
14 was going to go to my colleagues, but with two things. Let me
15 tell you that right now in the Department of Energy we have a
16 departmental task group working on vehicular safety because we
17 look at our 150,000+ people, we look at where our greatest
18 concern is for personnel safety, it's in vehicular accidents.

19 Our approach is not to promulgate new requirements.
20 This is just our approach. It is to start, first of all, with
21 education and awareness, engaging people in really examining
22 what is and what is not safe driving behavior, also working
23 with them on practical things like saying okay, we have line
24 dispatch crews and things like that that communicate by radio
25 and saying okay, managers, you know, you communicate with your

1 staff in the field by these -- by these cell phones, radios,
2 things like that, you recognize that they are driving. Okay.
3 How are you going to work together to try to promote safer
4 driving behaviors and use of communications?

5 We don't have an answer. We have an approach. And
6 our approach is to start with awareness, education, and then
7 once the behaviors are identified and expectations and we hope
8 agreements in the field, then a period of reinforcing those,
9 examining those, before we consider the issue of disciplinary
10 action. That's our approach right now on that one.

11 I will say one thing about cell phones, for example.
12 Rick mentioned some of our operations. One of the things we do
13 because people like me, I forget. I happen to work in a
14 facility where I am allowed to have a cell phone, but without a
15 camera. There are places that I go into that I cannot use a
16 cell phone, but because it's an appendage to me they help me
17 not just by posting signs, but -- and this is just a point. We
18 have cell phone garages, okay, very prominently, so when I go
19 into an area that says you can't have a cell phone here, okay,
20 there's a garage, okay. And then in some places we actually
21 have -- like at WalMart, you know, the detector units, we put
22 chips, RFID chips, on the cell phone that when I walk past a
23 cell phone safe area it goes beep, beep, beep. It reminds me
24 that I have a forbidden item, and before I get into a violation
25 zone it says hey, a reminder. Okay, so now I can put this in a

1 little garage and I don't get into violation space. So those
2 are some of the ways that we're trying to think about that.

3 MS. JETER: Okay. And, last, Dr. Hartley, do you all
4 have a zero tolerance policy or what do you think of that, I
5 guess, concept when it comes down to trying to change behavior?

6 DR. HARTLEY: Zero tolerance with regards to what
7 now?

8 MS. JETER: Well, I'm thinking of the cell phone
9 policy, but it could be any rule or any infraction or any
10 accountability, which is the word we used earlier.

11 DR. HARTLEY: Yeah. There are very specific rules
12 established at Pantex for lots of good reasons, and they're
13 well communicated. Everybody's trained to them on an annual
14 basis. We typically go through -- every year we have to go
15 through retaining for the whole year and everybody goes back
16 through the same process all over again, so we spend an
17 inordinate amount of time and effort training people,
18 qualifying their training to make sure it actually works. And
19 then when we have, for example, cell phones, yes, every issue
20 detected or self-reported, which is typically the case, gets
21 addressed with zero tolerance.

22 DR. ROBERTS: I look at another issue with regard to
23 that and that is your best policies and rules are going to be
24 those that were made with the people -- together with the
25 people who will be faced with them or, you know, required to

1 follow them, and the reason for that is there is very good
2 evidence that if people engage in the decision making they buy
3 into it better.

4 MS. JETER: I agree. All right. Thank you, Mr.
5 Chairman.

6 CHAIRMAN SUMWALT: Thank you, Ms. Jeter. Now to
7 Alstom. No questions?

8 MR. ILLENBERG: Correct.

9 CHAIRMAN SUMWALT: Thank you. And --

10 MR. PASCOE: I have no questions at this time. Thank
11 you.

12 CHAIRMAN SUMWALT: No questions. FRA?

13 MR. MCFARLIN: Yes. Thank you and good morning, and
14 I'd like to thank each of you again for the very interesting
15 and informative presentations. I have two questions and it's
16 open to whomever would care to respond, the first being could
17 you please expand on the principles and processes associated
18 with the identification and measure of what I'll call actual
19 results of error or failures, in other words accidents,
20 injuries, things that manifest themselves in that way, versus,
21 while those are certainly important, the ones that are
22 underlying or laying in the weeds, if you will, such as risks
23 or near misses, those things that don't actually show in the
24 way I stated?

25 DR. ROBERTS: Well, underlying potential causal

1 factors show. They just don't show as brightly. And I think
2 near misses should be measured -- the commercial aviation
3 industry in this country measures near misses pretty carefully
4 and can correct problems because it has a reporting system
5 where pilots can report, and if one pilot -- if there are two
6 pilots involved and one reports and the other doesn't, that's
7 trouble for the other one, so -- and it learns a lot from that,
8 not as much as they would hope, but those are near misses and I
9 think near misses should be subjected to review.

10 CHAIRMAN SUMWALT: Thank you. Anyone else?

11 MR. CARNES: I'm not exactly sure where you're going.
12 May I try this and see if it's responsive?

13 MR. MCFARLIN: Certainly.

14 MR. CARNES: I would say, generally speaking, that up
15 till maybe the early 1990s because I came here in the early
16 1990s the philosophy on reporting things, if that's where
17 you're going, was to a large extent compliance oriented, if I
18 violate, I will report.

19 Now we believe that is necessary, but we believe it
20 is not sufficient, okay. We have seen an increasing -- I'd say
21 improvement is what I wanted to say, but I say a change in
22 behavior, that people are gradually understanding that the
23 smaller the item is reporting that is even much more desirable
24 because it allows us to predict -- you know, trend predict and
25 prevent.

1 Example, pre-job briefings are extremely important in
2 most of the work that we do, so we want to use some of those
3 tools that I showed like air precursors to say what might go
4 wrong in this area today. Okay. We've got a job package here,
5 we've got all that kind of stuff, but still we want to think
6 about what might go wrong, and then we're going to go in with
7 our plan, as good as a plan can be, and we're going to do our
8 work that way, but like Rick said, if we find something we may
9 have to stop work, we might have to whatever.

10 Now when we come back from that we want to do -- the
11 best situation. We don't always do it, but we want to do a
12 post-job brief and say okay, how well did the plan that we made
13 compare with our actual experience today? Nothing bad
14 happened, nobody was hurt, we didn't destroy anything,
15 whatever, but did it go the way we thought it did and why did
16 it not go the way we thought it would go and what are we going
17 to learn from that? We consider that the kind of reporting, if
18 you will, that we're trying to support and engender, okay? If
19 we do that, we -- our theory is that we don't get to the point
20 of reporting violations because we avoid them.

21 So that's the discussion that we're trying to promote
22 and the culture that we're trying to build that we talked about
23 "reporting" at those levels rather than the violation level.
24 Does that help?

25 MR. MCFARLIN: Yes, yes, exactly.

1 DR. ROBERTS: There's a -- frequently -- I know of a
2 number of organizations that every time they do an event,
3 whatever the event is, if it's important, they do what's known
4 as a hot wash-up, and that analyzes the event for just the
5 reasons that -- and it's formalized within the organization.
6 Some organizations call it something different, but it's a
7 post-event analysis that will look at the event, how could we
8 have done it better, how could we -- and that's exactly the
9 same thing and it's actually formalized. We're going to try
10 something and let's see how it worked out, and it's also very
11 good training, extremely good training.

12 DR. HARTLEY: Yeah. And I guess what I would say as
13 far as the reporting of accidents, incidents, whatever it is,
14 you know, because we work for DOE it's a very formalized
15 structure as far as what's reportable, what's not reportable.

16 The other thing I would say is that every time we
17 have any kind of event that basically alarms us, whether
18 reportable or not, we do what we call a critique, and what
19 we'll do we'll pull all the workers, all the managers together,
20 and the whole idea here is to understand what the facts are,
21 and this is typically done within a couple of minutes, hours
22 after the incident before people start, you know, changing
23 their opinion, so to speak. So that's, I guess, a unique
24 process within DOE, to understand -- make sure you understand
25 what the event is and, based upon that, to characterize where

1 it id significant enough to be reportable or not.

2 Now in regards to your near misses, you know, like
3 Earl mentioned before, near misses are something they try to
4 encourage the reporting of, investigation of. And, you know,
5 at Pantex I would characterize some of these things as what we
6 call these information rich events. And people always ask us
7 what do you know or how do you know when you have a so-called
8 information rich event? Well, the bottom line is that, you
9 know -- and Earl talked about this gap between work as imagine
10 versus work as done. You know, when you go to these critiques
11 and you think you have the procedure in front of you, that you
12 think you know what the worker did, and all of a sudden you
13 realize the fact that worker didn't have the procedure out for
14 three years and, of course, it's kind of alarming to see
15 there's such a gap, okay. So that's one of the indicators
16 there.

17 The other one would be the fact that we find a new
18 hazard, and you always find new hazards as you do work that you
19 didn't have a control for, and DOE is very particular about
20 controlling hazards, and when you come down to it if it was
21 just pure luck to stop this individual from getting hurt,
22 that's alarming because luck is very predictable.

23 And the last one is if the incident could have been
24 worse, if you could have gone high order and it was just by
25 luck we didn't go high order, then that, quite frankly, alarms

1 a lot of people at Pantex. So those are the kind of things we
2 call information rich events, and those kind of events we'll go
3 and spend a phenomenal amount of resources to dig down and find
4 out what exactly went on, you know, at this particular case
5 right here such that we got in this kind of predicament.

6 And, again, this is much lower than the reporting
7 threshold that DOE establishes. These are things that we set
8 for ourselves and, again, we're allowed to do that below their
9 threshold, to go and do our own investigations, because all
10 we're trying to do is understand before we have that big
11 reportable incident what was setting the process up or the
12 human up for error.

13 MR. MCFARLIN: Thank you. My second question, and
14 actually it's probably sort of associated with the first, but
15 if you could again, and particularly Dr. Hartley because I
16 believe you touched on this in your presentation, expand on the
17 principles and processes associated with organizations being
18 generally highly proficient in correction of errors or failures
19 versus what you showed to be blind to identifying those types
20 of things and possibly a few ways that you would recommend
21 organizations could improve, shall I say, their eyesight.

22 DR. HARTLEY: Let me, first of all, say that, you
23 know, people would tell -- well, people would kind of
24 characterize as Pantex being highly reliable, which you like to
25 think that's the case, but I also say we are a typical

1 organization. Now we had a discussion during the break here.
2 You know, the hardest challenge here, we're dealing with human
3 beings and human beings exist in every organization, and so
4 this whole concept of detecting and correcting problems is just
5 as much a struggle for us as anybody else. Nobody but nobody
6 wants to admit they made a mistake, and it's not because
7 they're trying to cover stuff up, but most people who've gone
8 through this much training, worked at a job for so long, are
9 very proud of the work that they do.

10 And I don't know if you had this case or not but, you
11 know, when you make a mistake a home and you have to tell your
12 spouse you screwed something up and you had to fix the house of
13 whatever it is, that's kind of tough to belly up to the bar and
14 do that, so that's probably about the biggest challenge we
15 have, is not meeting the regulatory requirement, but getting
16 the people to recognize the fact that we all have these so-
17 called human errors and we need to admit them because that's
18 how we learn from them.

19 And I guess probably the hardest one I personally
20 have, as I mentioned before, when we have security infractions
21 we're required to report them. As soon as we recognize them we
22 have to report. That's hard to turn yourself in, that you made
23 a mistake, knowing full well that you could get disciplinary
24 action or whatever it is because there's zero tolerance, but
25 the bottom line is you know you have to because the bottom

1 line, for example, for security, if you don't stop the problem
2 it could get to be a high order problem for the country, so
3 it's either you or the country, and you go well, it's me first.
4 That's extremely tough.

5 But I would tell you this whole problem or issue
6 about detecting and correcting, correcting would probably be
7 the absolute hardest thing to do. Detecting is easy.
8 Correcting is extremely, extremely hard because, again, you
9 don't want to correct the immediate problem, you want to
10 correct the long term problem.

11 And we typically do this -- you know, typically
12 people are busy. They want to fix their problem and check the
13 box, get on with life because they got 10,000 other things to
14 get done, but the challenge is fixing the underlying problem so
15 that it doesn't reoccur.

16 And typically I think -- I forget who it was, Sydney
17 Decker (ph.) that I mentioned before that a lot of times when
18 you have an incident and we go through all these corrective
19 actions, root cause analysis, corrective action, and we think
20 we fixed the problem, well, that incident probably would occur
21 again for three or four or five years without any corrective
22 action whatsoever, and we think our corrective actions have
23 really fixed the problem. The issue is those problems don't
24 occur that often in the first place, and so we kind of allude
25 or we convince ourselves that we actually found the problem,

1 fixed the problem, when, in fact, we probably have not, and to
2 dig down really, really deep to find out that really so-called
3 root cause, that organizational issue, is probably the biggest
4 challenge and then having the guts to go fix that challenge
5 because typically those are the big, big problems at the
6 organization.

7 MR. MCFARLIN: Thank you. Either or the other wish
8 to add anything?

9 MR. CARNES: Let me add one of my pet peeves if I
10 may. When I pose questions like you do when I go out and do
11 assessment reviews, whatever you want to call it, I have -- on
12 occasion I say tell me about your casual analysis, your
13 corrective action and so forth, and I've actually had people
14 say well, you know, we purchased this software program for
15 causal analysis and we've trained our people on it, and I'm
16 waiting for the rest of the discussion and that's the answer,
17 which I don't accept as a satisfactory answer because I believe
18 that causal analysis and corrective action as Rick described it
19 is a -- I'll call it a core competency of a highly reliable
20 organization which takes training. It takes dedication of time
21 and knowledgeable people. And senior management has to
22 demonstrate by the training it provides and the time that it
23 provides of the management team and the requisite technical
24 staff to fully analyze and understand and evaluate. That
25 demonstrates to me that you're serious, that this is a key part

1 of how you run your organization, not a software package that I
2 bought that gives me an answer.

3 MR. MCFARLIN: Thank you. I have no further
4 questions.

5 CHAIRMAN SUMWALT: Thank you, Mr. McFarlin. And FTA?

6 MR. FLANIGON: Thank you. And good morning and thank
7 you all for really some very thought provoking concepts and
8 discussions. I have a couple of questions and I'll pose these
9 to you as a group and whoever would like to take them or if
10 you'd all like to take a turn at them that would be great.

11 One of the subjects really of this hearing has been
12 oversight, internal oversight by an organization and external
13 regulatory oversight, and so my question has to do with
14 particularly from a standpoint of external regulatory
15 oversight. How can an external regulatory oversight program
16 foster, create, support and/or not detract from the kinds of
17 organizational improvements that you all have been talking
18 about?

19 DR. ROBERTS: You're the regulator.

20 MR. CARNES: Allow me to answer the question in a
21 slightly different way. I would say that the endpoint of your
22 question about a regulatory approach that would -- that does
23 not deter from the objectives of high reliability is a very
24 important question. I'd like to separate that from another
25 answer if I may, and that being possibly an implicit

1 assumption. I'm just going to do it hypothetically as an
2 implicit assumption to say that regulatory oversight is
3 sufficient to produce an HRO and I would argue that that is not
4 the case. I argue that regulation is necessary. It is a
5 social contract that we make to live up to a certain set of
6 standards, and that the regulatory should scrupulously inspect
7 and enforce those standards on behalf of the larger society.
8 To be a high reliability organization there are levels or
9 different types of oversight I believe that are necessary that
10 must transcend that.

11 As I mentioned, I work for an organization that was
12 established by the commercial nuclear power industry in the
13 United States committing itself to its own self-assessment
14 above and beyond what the regulator does. I would suggest that
15 what my colleagues at Pantex have done is they have developed,
16 you know, in effect, you know, their own standards of
17 expectation and self-assessment that go beyond what we as DOE
18 as a regulator/owner do. So I'd just like to expand the
19 discussion and say that regulation is sufficient, but I believe
20 different types of oversight are necessary to truly have an
21 HRO.

22 DR. ROBERTS: Go ahead.

23 DR. HARTLEY: Yeah. Let me kind of reinforce that.
24 I guess not being a regulator but being influenced by
25 regulators, I guess what I would say and the one thing we've

1 experienced is we're going through this, let's call it,
2 discovery process of high reliability in which you go through
3 and basically discover problems that before we never solved
4 because now we're being a little more open.

5 Now I would tell you this issue about trust works at
6 an organizational level just like it does at an individual
7 level, that if the regulators come in and were pounding us
8 because of things we discovered -- now the problem is when you
9 go to discovery you report more things. Typically that's taken
10 as a bad sign, but not when you're discovering more small
11 things.

12 So the bottom line is, you know, for this process to
13 work those who regulate must understand the process and give
14 the organizations time to find and fix. I don't mean just say
15 they're going to fix, but really fix the problems because
16 without that organizations don't feel free just like an
17 individual wouldn't feel free about admitting a problem if you
18 pounded that individual for every error they made.

19 The other thing that -- and this is kind of the
20 really interesting part of the process here. The organizations
21 are nothing but a product of the environment that they're in.
22 So we go back to our DOE counterparts and say we are who we are
23 because of the environment in which you established. We're
24 simply being responsive to what you asked for.

25 And I mentioned a while ago about following the

1 money. When DOE puts money in certain things we deliver.
2 That's what we get paid to do. And so the bottom line is put
3 your money where your mouth is. If the safety's truly
4 important, put your emphasis on safety and that will be driven.
5 That will become a predominant characteristic that you happen
6 to have, but you've got to look beyond the organization because
7 they're simply trying to survive the environment that you put
8 them in, so if you want them to change, you yourself as a
9 regulator also have to change.

10 DR. ROBERTS: I used to think that the best
11 regulation was the kind that came in and whopped everybody on
12 the head, but certainly in HRO that isn't true. You almost as
13 a regulator have to act as a learning partner with the
14 organization that you're regulating.

15 And I know -- because I'm afraid of punishment, don't
16 like it very well. I've watching trainers come in who are
17 really regulators to complex organizations. They come from
18 another part of the same big organization and they're really
19 regulators. They're telling the organization well, hey, over
20 here somebody tried X, seemed to work for them, and that's the
21 way they spread the learning, too. So I actually think in this
22 situation -- I wouldn't say -- I think the word partner is
23 incorrect. I mean regulators shouldn't see themselves as a
24 partner, but I've watched an awful lot of regulators really act
25 as maybe more trainers than regulators, and it's seen that way

1 by the organization which then ups the level of trust.

2 MR. FLANIGON: Great. Thank you. One of the things
3 that was -- that you just alluded to, the -- you know, the --
4 or several people alluded to, adjust organization and trust and
5 so forth, what element of that has to be being able to bring
6 things forward without fear of reprisals? Does -- do your
7 organizations have a mechanism such as a whistleblower kind of
8 arrangement where there's a way if your direct reporting
9 structure isn't receptive or doesn't follow that precept of not
10 punishing? Do you have a mechanism beyond that?

11 MR. CARNES: Allow me to start. Perhaps you'd like
12 to pick up, Rick or Karlene, but the direct answer to your
13 question is most emphatically yes. We have those provisions
14 within our regulation. That is the CFR requirements that we
15 have. By the way, our Integrated Safety Management System that
16 I mentioned earlier is captured through that. That is a part
17 of it. We have those through our contractual mechanisms, you
18 know, that are, you know, another enforcement mechanism, if you
19 will, contractually.

20 We have -- in addition we have employee concerns
21 programs. We have whistleblower protection. And also we have,
22 very importantly, different professional opinions processes,
23 okay, where -- you know, where we encourage people to air their
24 opinions, and a lot of this comes from the Columbia situation.
25 And so that if two qualified professionals have differing

1 opinions, we require and encourage our organizations to have
2 processes by which those technical opinions can be aired in a
3 transparent manner and -- so that the organization can make a
4 decision on which -- you know, which -- sometimes many
5 competing technical viewpoints will prevail, but that they are
6 justly and accurately and technically, validly, if you will,
7 aired, so we have a lot of those kinds of things. We believe
8 they are extremely important.

9 DR. HARTLEY: All I want to say is, you know, we live
10 in this environment here and we have all the processes which
11 are required by DOE. And as far as, you know, different
12 professional opinions processes there's a new process that
13 DOE's embarked upon in the last couple of years and it does
14 give a good venue because a lot of times you do have different
15 technical opinions because, you know, even though you think
16 this is a science, safety, there's a lot of fuzzy areas there,
17 and so the idea is it gives them -- the managers a venue to I
18 guess weigh the options of various technical opinions, and
19 typically the decision or recommendation decision is rendered
20 by technical persons to try to judge that as opposed to a
21 manager.

22 And so, yeah, we have lots of those vehicles in place
23 and we encourage people to use them whenever possible. And
24 typically, you know, we encourage them, you know, to go to a
25 supervisor. We hope that's the first line of defense because

1 that's where the problem should be solved. We try to provide
2 people all kinds of venues to bring issues forward and their
3 concerns about them.

4 DR. ROBERTS: There's certain mechanisms that you can
5 use to encourage that sort of thing. I do worry about a
6 question that you brought up previously. I do worry about
7 those mechanisms falling apart. A whistleblower goes above his
8 or her supervisor to air an issue and bad things start to
9 happen. So I actually really do still worry about that even in
10 organizations we think of as HROs. But one mechanism for
11 dealing with that is to place in the culture periodic meetings
12 which will talk about some of these technical kinds of things
13 or personnel issues or other issues, and that -- if it's done
14 correctly and creates a culture which is open, that's a nice
15 mechanism for talking about things that you are concerned about
16 including why somebody got the job that you didn't get because
17 that's good fodder for traumatizing your organization.

18 We were just dealing with an organization last week,
19 and I don't think they'd mind us identifying them. It's a
20 probation department actually, a very up-to-date probation
21 department, and they want to -- they've been in the business of
22 doing HROs since 2006 and so we've been, you know, kind of
23 watching them. Why would you think of a probation department?
24 Well, in the first place, probation departments can kill
25 people. I didn't think about that. They're holding some

1 people who are pretty dangerous. And they're going to lose 25
2 percent of their staff in the next little while.

3 And the issue was can we afford to continue to do HRO
4 and my colleague said you can't afford not to because you're
5 coming into a crisis period. You've got to make the best of
6 your resources. You have to take care of each other. Those
7 stayers and those leavers are, you know, personally concerned.
8 After all, they're losing their job. So they have to go
9 through some sort of interaction with one another where the
10 importance of taking care of each other is stressed because the
11 situation's going to cause psychological problems big time and
12 these are people who handle guns. And so that was the issue,
13 you're in a crisis now, you can't afford not to.

14 So one of the things they thought about because
15 there's a guy that's going to stay that everybody wishes would
16 leave -- there's always that. And so how do you open the
17 discussion to have everybody's views aired on that and not harm
18 anybody?

19 MR. FLANIGON: All right. Thank you. A couple more
20 if I have time and I'm prioritizing in case I run out of time.

21 CHAIRMAN SUMWALT: Let me -- tell you what. I would
22 -- we will come back for Tom. We're trying to keep it
23 generally about ten minutes, and so can we just move on and
24 then come back to you on the second round? Will that be okay,
25 Mr. Flanigon?

1 MR. FLANIGON: Sure.

2 CHAIRMAN SUMWALT: Good. Thanks. TOC?

3 MR. MADISON: Thank you. We just have one question
4 for the panel and a similar but somewhat different question to
5 the one asked by the FTA. Under the framework of the HRO model
6 how would you describe the attributes of a productive and
7 effective relationship between a safety oversight agency and
8 the entity being overseen? And if you could please just
9 elaborate on the broader topic of oversight rather than
10 strictly a regulatory model.

11 MR. CARNES: I don't understand the exact
12 relationship, you know, that you have, so please forgive me.
13 So may I just speak generically to the question? Thank you.

14 I would play off of what Dr. Roberts started, the
15 theme of oversight as a function of classical inspection
16 compliance. I understand that, but it begins there and doesn't
17 stop there, and she suggested that an additional role is one of
18 education, a facilitator of change.

19 So that might be an interesting place to start the
20 discussion, you know, is to say what are the constructive
21 roles, multiple roles, plural, that an oversight organization
22 might play based on your analysis of the circumstance that the
23 entity that you oversee is in right now because it is my
24 viewpoint that an oversight organization must evolve and change
25 over time as well as the organization being overseen.

1 You know, if we go and we look at the history of
2 regulatory thinking and we see how that changed we go from a
3 prescriptive, you know, rule compliance based approach to in
4 some cases what we refer to, you know, as a risk informed, you
5 know, approach. All are valid and each applies at different
6 times to be in the maturity of an organization in technology,
7 so one of the questions that an overseer has to constantly be
8 asking I believe is what model or models of oversight best
9 apply given where we are at this point in time. It is a very
10 intellectually demanded exercise, but one that I think is very
11 worthy, you know, of that organization to be constantly
12 pursuing.

13 I would tell you that we have a small community
14 within our federal community we refer to as a high reliability
15 roundtable where we get together and as federal personnel have
16 these discussions, and what you raised is a discussion that we
17 often have, what are our respective roles as, you know, federal
18 employees and federal servants, and we recognize that yeah,
19 it's not just to be a policeman, if you will, and always write
20 parking tickets, but we have also responsibility to educate, to
21 inform, to advocate debate on better models. So those are
22 discussions that we have ourselves if that helps.

23 DR. ROBERTS: You might also recognize that you may
24 learn something from the overseeing and that will change your
25 relationship with them and it will change them and it will

1 change you.

2 DR. HARTLEY: I guess what I'd add to that is that --
3 and we see it in our location, too. You know, it's very
4 important to educate, but again you go back to this technical
5 safety foundation, you got to have the mechanics in place, but
6 the one thing you don't want is have your oversight part of the
7 problem. Somebody has got to remain independent because when
8 you start pushing the ball over the hill everybody becomes
9 focused and somebody has got to, you know, stand outside and
10 watch the P's and Q's as far as the safety requirements and you
11 don't want to become hostage to that, so safety oversight, we
12 must remain independent to the point where they are truly
13 giving objective opinions on safety and not becoming part of
14 the problem.

15 MR. MADISON: Okay. Thank you very much. We have no
16 additional questions.

17 CHAIRMAN SUMWALT: Thank you. WMATA?

18 MR. TABORN: Thank you very much, Mr. Chairman, and
19 thanks to this panel for providing an outstanding presentation.
20 We've all learned a lot from your respective research and
21 experience. And during the course of this hearing the topic of
22 safety culture has come up frequently, and safety culture could
23 be the good or the bad, but for the purposes of my questions
24 we're going to be talking about good safety culture.

25 My question is is safety culture the byproduct of a

1 structured HRO? When we get a safety culture, a good safety
2 culture, is that as a result of a good HRO program?

3 MR. CARNES: Dr. Hartley and I spent all day
4 yesterday in our most recent meeting of our Department of
5 Energy safety culture working group. This is an initiative, if
6 you will, an effort that we undertook somewhat over two years
7 ago, I guess, Rick --

8 DR. HARTLEY: Yes.

9 MR. CARNES: -- because our leadership, contractor
10 partners, DOE leadership, felt that it was of sufficient
11 importance that we undertake a full and informed consideration
12 of what we mean by culture and safety culture and what we're
13 doing about it.

14 Respectfully, I'd suggest that we try to have this
15 conversation, that culture is neither good nor bad. The
16 question is how is the culture that we have influencing the
17 safety behaviors that would produce a safety working
18 environment, you know, so we have -- we've got to have those
19 kind of discussions.

20 I would tell you that most of our people involved
21 are, you know, contractor level, vice president, senior
22 technical people, scientists or engineers, and they are who
23 they are in their positions because they have been very
24 successful as technical project managers and it makes their
25 head hurt to talk about these things because of the sociology

1 and psychology, but they have persevered to their great credit,
2 and it is hard, very hard.

3 So after going through reams of literature we decided
4 a year or so ago to say okay, let's focus on three things,
5 leadership, employee engagement and organizational learning,
6 and volunteer to go out and do some pilots to see how you might
7 approach one or all three of those things to better understand
8 new culture and then what things might you undertake to
9 improve.

10 Yesterday those organizations come back -- coming
11 back and reporting. They were all different and they were all
12 very good. They all said we learned things that we didn't know
13 about how our organization thinks that helps us understand how
14 we act the way that we act, okay?

15 Now that's only indirectly responsive to your
16 question, but I hope you'll allow me to do that, to say that at
17 the very highest levels, which in our case is our chief
18 operations officers, the deputy secretary of Energy, you know,
19 along with our senior contractor executives have said this is
20 sufficient and important. We're devoting resources, people,
21 time and organizational experiments, to figuring out how to
22 understand it and do it better. That's the direction that
23 we're headed, so we don't have a --

24 Oh, I'll get to one other thing. I believe, me
25 personally, that what we talk about HRO is reflective of a

1 particular unique type of culture.

2 MR. TABORN: A follow-up question would be would one
3 approach seeking to enhance the safety culture without seeking
4 to apply an HRO approach first?

5 DR. ROBERTS: The pioneers of what labeled HRO, they
6 were driven by a couple -- they were driven by money. They
7 were driven by a couple of factors. One was money, and the one
8 I'll mention is the U.S. Navy.

9 The U.S. Navy in the late 1950s was just losing too
10 many aircraft and too many aviators, and Congress wasn't going
11 to replace those aircraft very rapidly. So they decided that
12 they had to do something so they set up what's called the Navy
13 Safety Center at Norfolk and they began to engage in non-
14 technological fixes and they didn't call it HRO, but their
15 objective was the bottom line of improving safety. And they
16 found -- I don't know if they intended this, but they found
17 that over time -- if you look at the chart of losses over time
18 and go way down to a day there about 3 per every hundred
19 thousand hours flown it's a very, very low loss rate, and they
20 found that they had engaged three technological fixes. One was
21 the jet engine. Planes could fly higher and, therefore, were
22 safer. One was the angled deck, and the third one was the
23 finile ends (ph.) that could bring the aircraft in.

24 All the rest of the fixes, and there were lots of
25 them, were human fixes, so they were things like additional

1 training. They were things like teaching people exactly what
2 errors to look for, and all these things were additional fixes
3 so that by the 1990s they had gotten to a safety rate that was
4 pretty high. What we noticed was to get there they had to
5 engage in processes that we labeled high reliability processes.

6 Now what did they tell me about that, just so you
7 have the rest of the story? They said look, we knew what we
8 were doing, come on, we did it. We knew what we were doing.
9 We didn't have the conceptual boxes to put it in and to help us
10 talk about it, so we said things like mindfulness, situational
11 awareness, and that gave them a set of conceptual boxes to
12 organize their conversation basically. So they didn't talk
13 about HRO, they talked about, you know, money and safety and
14 stuff like that.

15 MR. TABORN: And the last question this round is say,
16 for instance, a transit agency, roughly 10,000 people, would
17 want to approach the HRO process and one would consider the
18 planning, the development, the training implementation and
19 evaluation would take place. What is the realistic timeframe
20 for this process to happen and the cost?

21 MR. CARNES: There's a phrase that I've heard. I
22 don't understand it because I work for a living. That is if
23 you have to ask the cost you can't afford it.

24 Now I don't mean that sarcastically. What I mean is
25 perhaps there's a different way to ask the question, okay, and

1 that is how might we start because -- there's another phrase
2 you may have heard, there's no there there. This is not an
3 initiative. It's not a program. It's not a project. It's a
4 way, first of all, of thinking and a way of living, so there is
5 -- there are -- I should say I believe there are beginning
6 points and there are suggestions that any of us could give you
7 about how -- different ways to begin. You have to decide, but
8 there is no end in sight and there is no budget.

9 I mean that's the way -- the only way I know to try
10 to help you understand that it's a different way of thinking
11 about things and, believe me, I've seen all kinds of safety
12 initiatives and I'm sure you have, too, and Rick talked about
13 it. We don't fool with the people that work for us. We've got
14 a phrase in DOE. It's called Webe. We be here before you, we
15 be here after you. You come in with your bright idea, okay,
16 and we still here when you're gone, okay? They know. They're
17 smart, intelligent people. They got to believe that it's real,
18 it's going to help them and they're going to live it.
19 Otherwise, it doesn't work. Yes, I'm kind of serious about
20 that.

21 MR. TABORN: Thank you very much.

22 CHAIRMAN SUMWALT: Thank you, Chief Taborn. I take
23 it that the D.C. Fire and EMS Department is not here today. I
24 don't see them. So we'll go to the HEU.

25 MS. JETER: Thank you. And I'd like to follow up on

1 that because I think sometimes when you look at some of the
2 problems or some of the situations that have brought us to
3 actually listening to you all and paying attention it's a
4 daunting task and that's what I think Chief Taborn was alluding
5 to, so I will simply ask what are -- what is the first step?

6 DR. HARTLEY: Let me address that one. If you don't
7 educate the leadership it goes nowhere, and I would tell you --
8 you know, and it comes down to this. You know, people talk
9 about this business case for high reliability and people try to
10 make it a money case or whatever it is, but I would tell you
11 when you go through and inform people of this process or the
12 structure, whatever you want to call it, so to speak, you'll be
13 absolutely amazed how people light up and the basic question I
14 get back is why didn't we do this earlier? And it's such a
15 very simple logical process and, again, it goes back to where
16 you guys know what to do.

17 This is to provide your framework to better
18 understand, you know, what you need to do with what you
19 currently have, and you'd be surprised how people just
20 absolutely light up when they see this process and they say why
21 is it so simple for -- and I think part of the problem is we've
22 complicated the world so much with all these things we've got
23 to get done, but again there's only a few things that are
24 really important and you've got to go back to the basics and
25 this process here makes you go back and rethink and it's really

1 a nice -- it's just a -- I can't explain how nice it is when
2 you see people's eyes light up. They go I got you, I got you,
3 got you, and they go back and do stuff. And, again, it's not a
4 program cost. It's just get the people motivated to go do that
5 and the first people are the leaders.

6 MS. JETER: Thank you. Question number 2, do most
7 organizations make the mistake of believing -- that you've come
8 in contact with with trying to teach them the HRO, do most
9 organizations make the mistake of believing that once the human
10 is punished the problem is corrected?

11 DR. ROBERTS: Unfortunately, that's true. We're
12 still in a name/blame train or fire world, I think, and I think
13 we just want them to -- we want people in organizations to take
14 a different look at the situation than that because we happen
15 to see all the fallacies of that kind of view of an
16 organization.

17 The other thing I was thinking of as you were talking
18 is Rick comes from a highly unionized organization. I haven't
19 been dealing with unionized organizations, but I think the
20 union and the organization have to work, you know, together,
21 all parts. Not to point out these two entities, but all parts
22 of the organization have to work together or nothing works for
23 you. And I believe the part about, you know, about senior
24 leadership that we see in every organization is done well.
25 We've seen senior leadership take hold.

1 MR. CARNES: Just a quick, if I may, amplification.
2 I had the honor of being invited to the Institute of Nuclear
3 Power Operations Chief Executive Officer Conference. This is
4 the chief executive officers of the major utilities in the
5 United States meet once a year, and these are very, very large
6 organizations, as you appreciate.

7 So one of the speakers stood up. I showed you that
8 improvement chart, you know, the yellow thing and all, earlier.
9 One of them stood up and said that he believed the most
10 important thing that they had learned over all these years
11 since Three Mile Island was that humans do not intend to err
12 and they do not intend to cause accidents, and with that shift
13 in thinking then they were able to start taking actions that
14 could really improve things.

15 MS. JETER: And, lastly, you talked earlier about
16 strong language that you can have to get people to report
17 incidents such as whistleblower protection language, and
18 earlier someone, and I don't know who it was, it might have
19 been Dr. Hartley, talked about trust. Is that a beginning step
20 to creating trust, letting the workforce know that you have
21 these protections here, it invites them to give you
22 information, or is there something else that can be done first?

23 DR. HARTLEY: I would tell you the processes that we
24 have put together because DOE requires us to put together are
25 the last step. I mean what works at the absolute best -- and I

1 keep on kind of going back to this. When the manager goes out
2 to the shop floor before there's a problem and just talks to
3 the workers and listens, then you get that trust process
4 started.

5 And, you know, the worker or the manager will see
6 things being done wrong. The idea was not to make a big deal,
7 but start negotiating or just discussing these issues here and
8 bringing the people back to play, but I would say, you know,
9 that's kind of the last line of defense. Those are the
10 mechanics that we would put together such that if the system
11 failed, there's another safety system behind that to get the
12 reporting chain to go back and work it again, but you don't
13 want to rely upon that. You know, if people aren't forthcoming
14 and, you know, willing to trust you to bring the stuff forward
15 and if you don't instill trust in them you've got a long way to
16 go before you start getting this process going.

17 MS. JETER: Okay. Thank you. Thank you, Mr.
18 Chairman.

19 CHAIRMAN SUMWALT: Thank you, Ms. Jeter. Alstom?

20 MR. ILLENBERG: Mr. Chairman, first, I'd just like to
21 apologize for stepping out to the Board, to the panel and to
22 everyone else. I had just been notified my flight was
23 cancelled and I was trying to make arrangements for somebody to
24 look into alternative arrangements, but I do want to apologize
25 for not being here. I really have no questions, but I just

1 want to say I found your presentation very interesting, and I
2 think your conversations about the culture and the people is
3 really important because that is how we get safety in reliable
4 organizations and I appreciate what you've done.

5 CHAIRMAN SUMWALT: Thank you. And I appreciate your
6 thoughts as well. Thank you very much. And --

7 MR. PASCOE: I just want to remark on my colleague's
8 --

9 CHAIRMAN SUMWALT: I'm not sure this microphone is
10 working so well.

11 MR. PASCOE: I'd like to thank the panel for their
12 excellent presentations and information. Thank you.

13 CHAIRMAN SUMWALT: Thank you. Thank you all. FRA?

14 MR. MCFARLIN: No further questions. Thank you.

15 CHAIRMAN SUMWALT: Thank you. And Mr. McFarlin [sic]
16 with the FTA?

17 MR. FLANIGON: Thank you. Now I lost my -- oh, I
18 know what it was. There's this phrase about how things might
19 have fallen through the cracks and a lot of times those cracks
20 are the lines on the organization chart between the engineering
21 department and the maintenance department and the parts
22 department and so forth, and it sounded like, you know, one of
23 the real precepts of high reliability organizations is the
24 ability for people to talk to each other and coordinate and
25 communicate.

1 Can you give some concrete examples of ways that you
2 achieve that so that there aren't the kind of silo approach
3 that we I think as humans to kind of tend to naturally, you
4 know, out tribe versus their tribe kind of thing?

5 DR. HARTLEY: Yeah. Let me first of all say it's not
6 easy and it a lot of times doesn't work. This whole issue
7 about getting stove-piped is -- you think about this whole
8 process here. The more specialized you get the, more stove-
9 piped you get and you're kind of pushing water uphill.

10 One of the ways we try to do this is rotate people so
11 we have people, engineers. We send them down the line to do
12 operations type of work, and then all of a sudden they realize
13 the procedure they wrote didn't quite work well when they've
14 got to try it themselves. It's an eye-opening experience and
15 people wonder, you know, why you go through this expense, but
16 until you go and live in someone else's shoes you never truly
17 appreciate it. And when those guys come back to engineering,
18 boy, are their eyes open and all of a sudden they became kind
19 of the prophets in spreading the word, the whole nine yards.
20 It's probably one of the better techniques to do that, but I
21 would tell you that's always going to be a challenge, is that,
22 you know, working with organizations and getting rid of stove-
23 pipes is always a tough thing to do.

24 MR. CARNES: Just a couple of observations. One is
25 in the area of work planning and procedure development, okay,

1 is the multi-disciplinary teams that do that kind of work.
2 Karlene referred to it, but the institution has to establish
3 processes by which that is a collaborative endeavor not just an
4 engineering department developing an engineering procedure and
5 handing it down.

6 I will tell you that I was very successful in my
7 earlier days being a very intelligent management consultant,
8 going in and finding problems simply because I knew that the
9 people that actually did the work weren't involved and I'd go
10 and say okay, what's wrong with this and they'd tell me, and
11 I'd go back and I'd tell the CEO and I'd get paid for what
12 people of his own organization did, okay.

13 Now I know that's incredibly brilliant on my part,
14 but it's true. It's true. The people basically know what's
15 going on in their organizations and if you ask them to input
16 into fixing it and you make that a way the business works, you
17 know, that's one way. It's a very important way.

18 Another way -- I spent a lot of my career in
19 emergency management and I found that multi-disciplinary groups
20 getting all parties involved to get in and figure out how to
21 break things you get a dynamic going and that's where you
22 rotate them around, okay, and you make that part of their
23 professional development cycle, and they're getting in there
24 together going oh, we can break this, we can break that, oh, I
25 didn't know you guys did that, okay, how do we mess this thing

1 up? Okay. By figuring out how to break it you figure out how
2 to make it work. And that's just another technique, so --

3 DR. ROBERTS: The other thing that you find is that
4 once you get those groups together the first thing you'll find
5 is they're going to poster. The second -- but when they stop
6 doing that, you've got a good facilitator and they stop doing
7 that, the outcome of that is you have that problem? I didn't
8 know you had that problem. I have that problem, too. And then
9 there's a mutual fix. But oftentimes people don't really know
10 -- the right hand doesn't know what the left hand is doing, so
11 just the process of getting them to discuss their problems and
12 discovering that they have very, very similar problems.

13 MR. FLANIGON: Thank you. I had one other question
14 if I could for Dr. Hartley. You talked about the information
15 rich events and kind of lessons learned from those. What kind
16 of mechanism do you use to spread that information throughout
17 the organization and how do you -- if it is a event that's
18 related to someone making an error, how do you avoid -- I mean
19 there might be a tendency -- as you said, people don't like to
20 admit mistakes and how do you avoid kind of singling people
21 out, hey, Joe over here screwed up today?

22 DR. HARTLEY: Well, that's very important to do and I
23 can't say we've done a stellar job at it. The DOE has a
24 process called Lessons Learned Program, Operational Experience
25 Program, and, you know, the bottom line is -- and we've always

1 struggled with that because we put stuff out there that nobody
2 wants to read because it's not quite pertinent, whatever it
3 was, and I go back and telling people well, you know, the
4 problem is not the format. And what we're trying to do, by the
5 way, is make is short, colorful, glossy, kind of like a
6 newspaper type of thing so that it will entice people to learn
7 it, okay.

8 But the bottom line is that if you don't want to
9 learn something, and I don't care what you do or what I do,
10 you're not going to learn it. And, you know, the evidence
11 thereof is in some cases there are things that get your
12 attention that you want to go learn. You'll go learn them
13 without anything in hand. You'll go search the Internet or
14 whatever tool is available. You'll go find out what you want
15 to find out if you really want to learn the process or learn
16 what's happening or whatever it is.

17 So really the struggle there is not putting out a
18 color glossy that says here are the lesson learned, although we
19 do that because we're required to and we also find it a very
20 good tool because in our plant we have 3,000 people. How do
21 you share information with 3,000 people? Well, you try to get
22 out in every vehicle you possibly can. We have TV monitors
23 throughout the plant to show these lessons learned. And
24 typically what we've been doing lately, we'll get a video and
25 go back and reenact the event and show people this is what

1 happened, and when people see that -- when real people, not the
2 people involved, but actors so to speak, go through and reenact
3 the event they go my God, how simple, that process really was a
4 fix.

5 And we typically talk about this concept of missed
6 opportunities. I mean we all have thousands of opportunities
7 to stop something from occurring and we don't quite initiate
8 that. You know, it happens every day. So when people see this
9 they realize I could have avoided that person from getting hurt
10 if I would have said something before, you know, somebody else
11 got to that stage.

12 And so, you know, that's kind of the process we put
13 together. I'm not going to tell you it's stellar because it's
14 extremely hard. This whole concept of learning is extremely
15 hard. You can put stuff out there. You can try to work as
16 hard as you possibly can, make it colorful, glossy, everything
17 you possibly can, but the real thing is making people want to
18 learn which is extremely hard to do. And I think typically --
19 and, unfortunately, when people get hurt then all of a sudden
20 you realize well, maybe we shouldn't have had that incident
21 occur.

22 And so it's going to be a -- it's always a challenge
23 and I can't say we have the answer because I think DOE
24 struggles in general with that kind of concept, how do you put
25 out information, because typically we have so much information

1 it simply overwhelms people. So how do you put a system
2 together for people to go out and pick and choose what they
3 need to pick out? And I think the new concepts now are going
4 to a web-based type of process to put the material out there so
5 people want to go learn. They go pick out what they want to
6 learn versus having been inundated with so much stuff, but it's
7 a tough process, absolutely tough process.

8 MR. CARNES: Let me take a different slant, and that
9 is to what Rick said, but also the idea of multi-media and also
10 the idea of how do you make learning fun.

11 I think if we can't have fun in our organizations
12 since that's the major part of our life we've got a problem, so
13 I look around at some of our very, very innovative people like
14 -- for example, in the laboratory we have in Idaho you can go
15 on You Tube and you can find videos that the people made, and
16 I'll tell you CWI -- pardon me. You remember the Twilight
17 Zone? This is the Cwilight Zone, okay, and the employees said
18 because they were, you know, presented with this issue, how can
19 we share information and learn better, so they said -- a guy
20 came in in this dark black suit and this Rod Sterling voice and
21 said, you know, here it is. Okay, great. So the organization
22 funds these programs, resource them, funds them. The employs
23 come up with the idea. Then they have people that write the
24 scripts. The employees act. Okay. You can go on You Tube and
25 find this stuff, okay, and so it's fun. It's important safety

1 messages, okay.

2 So Rick mentioned videos. So we steal from one
3 another all the type and we're using those, but it's the whole
4 idea of being as innovative and creative and recognizing there
5 is no one communication mechanism nor style, and as much as you
6 can vary them I think the greater success you can be, and as
7 much as you can engage the multiple learning dynamics that we
8 have, videos, slides. You know, paper is boring. Lectures are
9 boring. We have multi-generational learning styles, you know,
10 so we're going to Face Book, we're going to Twitter, you know.
11 We're engaging every kind of age group and -- you know, and
12 employee group and saying how would you like to be communicated
13 with? So that's an important message. And, by the way, it is
14 fun, so go to You Tube and check out some of our stuff.

15 MR. FLANIGON: Thank you. That's all I have and I
16 want to assure you it's not been boring this morning.

17 CHAIRMAN SUMWALT: Thank you very much, Mr. Flanigon.
18 TOC, follow-up?

19 MR. MADISON: We have no follow-up questions.

20 CHAIRMAN SUMWALT: Thank you. WMATA?

21 MR. TABORN: One question, Mr. Chairman. In an HRO
22 process model how does the cardinal rule type violations apply
23 as they relate to safety issues or procedures as relates to
24 both management and the workforce?

25 DR. ROBERTS: Go ahead.

1 MR. CARNES: A couple of times the issue,
2 particularly of management as you just raised, so let me attack
3 it from that end first is that our causal reviews, if you will,
4 just to use that term generically, has been focused more and
5 more on management responsibility and accountability for
6 conditions that may set people up for failure or injury.

7 Again, not advocating a don't blame the worker, blame
8 the manager, but rather understand that the systems are
9 typically controlled by management, and so when you look at our
10 Integrated Safety Management System we focus on like
11 accountabilities and clear roles and responsibilities and
12 focusing on the management within that context and how we
13 allocate resources and so forth. And my whole point there is
14 just to say that we try to get more and more attention on what
15 are the managers, the management teams, doing and deciding that
16 may have contributed to these particular conditions.

17 Clearly, with what we deal with it is absolutely
18 necessary that we have mechanisms in place that if people
19 really just don't belong in the organizations that we run, we
20 have to address that. The vast majority of our people are --
21 you know, they're doing the right thing as best they can.
22 Occasionally we have to make the hard decision to suggest a new
23 career to people and we do that, okay, because we just can't
24 tolerate certain things and, believe me, we have to very, very
25 clear about that, but we also have to be very, very transparent

1 and we want the responsible people to be able to say, like
2 Karlene did, that this is fair and it is right and we agree as
3 much as possible with the decision. It's not perfect, but we
4 need those kind of guidelines. And the final thing is that
5 we're really, really trying to promote those discussions, okay,
6 as much as possible. I don't know if that helps, but that's
7 what we think about.

8 MR. TABORN: Thanks very much, sir.

9 CHAIRMAN SUMWALT: Thank you, Chief Taborn. We've
10 been through two rounds of questions from the parties. Are
11 there any pressing questions that you would like to ask? If
12 so, just please raise your hand. Seeing none, thank you.
13 Seeing none, I understand that Rick Narvell has a few brief
14 follow-up questions.

15 MR. NARVELL: Thank you, Mr. Chairman. Actually just
16 one because Mr. Flanigon stole my other one, but I just have
17 one final one and this goes to Mr. Carnes. I'll step back a
18 little bit to go to a bullet in your presentation that we had
19 discussed and I'd like to discuss that a little bit now.

20 There's a bullet in your presentation we want to
21 bring it up, but it's called Deference to Expertise, and I
22 guess I'd like to frame this question from the context of an
23 HRO. It's a situation where a worker is having to answer to a
24 higher authority, Allah, supervisor or someone who's been
25 around for many, many years and knows or suspects that a

1 procedure that he has been told to do is unsafe or potentially
2 unsafe. From an HRO perspective how would that be addressed?

3 MR. CARNES: This is the kind of culture that we are
4 trying to create and that HROs try to maintain, that
5 procedures, everything else -- there are tools that the
6 organization, you know, provides me to use. They may be
7 physical tools, but my procedures are my tools and my drawing
8 are my tools, and those are my tools, and I've got to make sure
9 that my tools work for me and that my tools stay in good shape
10 which includes procedures, you know, and guidelines and things
11 like that.

12 I would just say that I went into an organization one
13 time and we worked on some changes to this, and one day in a
14 critique someone was talking about changing a particular status
15 board that they were using, and this particular team spoke up,
16 the leader, and says no, you don't change those, those are our
17 tools, we'll tell you if they need to be changed. It was a
18 shift in terms of understanding what those -- that they are
19 tools, okay, and that as the user, you know, you have a say, an
20 ownership, as part of the culture. Okay. I think that's part
21 of the answer to your question, is that procedures and so forth
22 are not about compliance, they're about tools to get work done
23 safety. Okay. Everybody understands that.

24 Now you have a higher authority, a supervisor. Okay.
25 Rick mentioned this. We are adamant that there are stop work

1 authorities. Now we all know that that's difficult, so we have
2 gradations. We have something that we say okay, now if your
3 stop work carries too much baggage because of restart and stuff
4 like that, we have a thing that's called time out, okay. You
5 have to work around these things. What I mean is you have to
6 work it so people will do it and say okay, oh, a time out means
7 I'm not sure what's going on here, I need to confer with
8 someone else. Okay, I can stop for a few minutes. We confer,
9 okay, and we get clarification. Fundamentally it comes down to
10 if any worker believes that she or he are getting information
11 that could result in a danger to themselves, to others or to
12 the job, you know, they are given permission to stop.

13 The other side of the story is if they do that it is
14 a requirement on supervisors, on managers, on whomever to be
15 responsive to that request to stop. Again, I'm not sure if
16 that fully covers it, but in an HRO -- let me just stop using
17 those words. In the kind of culture that we are working to
18 maintain and to further establish that's the way we expect
19 people to operate. Uncertainty and concern is a basis for not
20 going forward until everyone is appropriately assured that they
21 can go forward safely.

22 We have emergency situations where we have to -- like
23 Rick says, the deference to expertise is the right people, the
24 right knowledge, the right skill set at the right point in time
25 and power to make the decisions to maintain the safety of the

1 operation. But that's the way a highly reliably organization
2 works. Does that help, Mr. Narvell?

3 MR. NARVELL: Yes, it sure does. I just wanted to
4 get a clarification on that particular bullet there, and thank
5 you for that explanation. That concludes my questions, Mr.
6 Chairman.

7 CHAIRMAN SUMWALT: Thank you. Are there any follow-
8 ups from the Tech Panel? Okay. Seeing none, we will now to
9 the Board of Inquiry. Mr. Ritter?

10 MR. RITTER: Yes. My question was earlier, Dr.
11 Roberts, in your slide presentation you had a list of latent
12 errors and I noticed one of them, the way it was characterized,
13 was lack of resources, and I'm trying to understand, I guess, a
14 little bit more about what latent errors are and how to
15 characterize that in an organization.

16 DR. ROBERTS: Well, I was trying to think of things
17 that are underlying in the organization, go on for a long time
18 and don't seem to bother anybody too much and then suddenly
19 come up and bite you, so in that sense I think lack of
20 resources -- I mean people deal with lack of resources all the
21 time or not -- insufficient resources, but at some point that
22 comes up to bite you.

23 There are certainly other things that are underlying
24 in organizations that suddenly come up to bite them. In
25 hospitals or health care settings we can think of lots of

1 things that, you know, nobody pays much attention to and then
2 they all come together at once and somebody dies or something
3 like that happens. I think the example I gave was the
4 whiteboard. You know why no one's writing on that whiteboard,
5 because no one wants to be responsible for the action they
6 would put up on the whiteboard. So the whiteboard is there,
7 but underlying that whole thing is nobody's trust of the
8 system. And nobody was talking about it. I finally got it out
9 of somebody by roaming the halls late at night.

10 MR. RITTER: So I guess they're afraid of the
11 repercussions if they write in error?

12 DR. ROBERTS: Yeah, if they write something down and
13 then it turns out to be a bad call for the patient and the
14 patient dies or needs extra care or whatever.

15 MR. RITTER: You also had a comment that -- you said,
16 I guess, if you starve an organization it can get rigid. I
17 think you said very rapidly. I was interested in expanding on
18 that somewhat.

19 DR. ROBERTS: Well, if you starve an organization it
20 will try to stay alive with the resources it has and it will be
21 just like a starving human being. It will cut off fat, slack
22 we call that in organizations. It will cut things back so it's
23 operating on just the bare minimal and it protects itself as
24 long as it can, so it's not too different from a starving
25 individual.

1 MR. RITTER: Okay. Thank you. That's all I have.

2 CHAIRMAN SUMWALT: Thank you, Mr. Ritter. And Dr.
3 Kolly?

4 DR. KOLLY: Yes. I have a question in the area of
5 training and I wonder if perhaps Mr. Hartley could answer this
6 question. How does a high reliable organization handle
7 training, and specifically I'm thinking about a traditional
8 training model that we all are used to tends to identify the
9 rules, this is what you do do, this is what you don't do. It
10 seems that there may be in an HRO more of an emphasis on
11 education rather than training, and what I mean by that is
12 you're talking about empowering people, letting them understand
13 the consequences, understand the system, because not every
14 instance can be trained for and recalled, so we've got to
15 install a knowledge of the system. And with that, where is the
16 role of critical thinking skills as far as trying to install
17 those in the workforce -- throughout the entire workforce? I
18 wonder if you can just give me your thoughts on that.

19 DR. HARTLEY: Yeah. I guess, first of all, I would
20 go back and re-emphasize the fact that the HRO process does not
21 work unless you have a very rigorous technical foundation
22 because, again, I go back to this focus on the physics concept.
23 People have got to be trained to what provides physical safety,
24 so the training process there is very kind of traditional,
25 going back, reviewing the processes. And, again, you know, we

1 have all these DOE requirements and you'd hope that some of
2 these requirements, at least all or some of them, would be
3 focused on safety.

4 And so, you know, what requirements do not provide
5 safety we also add extra layers of requirements on ourselves to
6 make sure we have those processes in place, and then we go
7 through a very, very rigorous process of -- actually it's more
8 than just training. We have to do training. We qualify
9 people. We actually certify people by on-the-job training and
10 stuff like that, so that's kind of the core foundation there
11 that you've got to start with.

12 And then you're right. On the -- I guess the
13 educational part of it, you know, training -- well, I kind of
14 phrase it helps you think about how to act inside the box.
15 Education helps you think outside the box when those conditions
16 arise, so to speak, and so we put a lot of emphasis on the
17 education part of the process here.

18 We've gone through and trained all of our senior
19 managers, both the feds -- this is kind of unusual. We're
20 actually training the feds on the same process we're going
21 through. So the feds and also the contractors go through this
22 training process and typically it's an eight-hour seminar. You
23 get things started, of course and then they go through
24 professional development beyond that, but we've actually
25 carried it further to the point where now every first line

1 supervisor goes through training and eventually the whole plant
2 will be trained in this process.

3 And it's more than just training. It's planting
4 those seeds. I think both Karlene and Earl can attest to the
5 fact that, you know, you can't make people do stuff like this.
6 You've got to plant those seeds out there to get the thought
7 processes going. So a fundamental key here is just the
8 education process which we think is a very important part of it
9 because without that people don't understand the concepts. If
10 you don't understand you can't implement them because, you're
11 right, there's lots of very ill-defined areas where you may
12 make have to make subjective decisions based upon that and the
13 idea is, first of all, have the right technical disciplines and
14 the right jobs to include the management positions because, you
15 know, the philosophy there is you can't manage what you don't
16 understand on a technical perspective.

17 But also educate them because, like Earl mentioned
18 before, this is not a typical process people get exposed to.
19 You don't see this in typical school curriculum, at least not
20 in the past. Most of the training is very hardcore disciplines
21 whether it be engineering or science or whatever the answer is.

22 And I've heard some researchers that were trying to get
23 involved in this process call it a pretty squishy process.
24 It's the organizational behavior part of the process.

25 But, again, I go back to the point where there is no

1 such thing as pure engineering. I mean engineers write
2 procedures. That's not what's getting implemented on the shop
3 floor. It's how people interpret the procedures and that
4 interpretation changes every day. It actually gets
5 accomplished on the shop floor. That's what's providing your
6 safety, not your procedure.

7 And so if people don't understand that they really
8 aren't delivering what they should be delivering, so this
9 educational process plants those seeds so that people can
10 further develop. And I would tell you for a fact, you know, an
11 eight-hour seminar or reading a short book doesn't help you a
12 whole lot. It gets your started, but you got to go back to the
13 basic research with Karlene and everybody else that truly
14 understand what they wrote about in the first place. There's
15 where you really get the education you need to make this
16 process work.

17 DR. KOLLY: Thank you. And just touching on this --
18 I mentioned the notion of generically critical thinking skills
19 and I saw some nods there on the panel. Can you train a
20 diverse workforce to improve their critical thinking skills,
21 perhaps Mr. Carnes?

22 MR. CARNES: I argue yes. Let me start at the top,
23 okay. We have -- and I clearly borrowed. We borrowed from my
24 colleagues in the commercial nuclear power industry. It was
25 decided a long time ago -- well, a number of years ago that we

1 need formalized transparent decision making processes so that
2 safety -- we make sure that safety is, in fact -- no simple
3 just buzz words on this, that we build into our processes how
4 we make critical decisions to that we make sure that safety is
5 the deciding criteria at the top levels. Okay.

6 So we have training on that. We call it operational
7 decision making. We provide that training. Just an example,
8 we provide that training. It's scenario-based. We're very
9 strong believers in scenarios, okay, because it's just nobody
10 likes to sit in a room and be talked at. You people have been
11 very kind and receptive. Thank you.

12 So what we do is we take all these interesting
13 scenarios and, frankly, we have a great one we use from the
14 Columbia accident. Our colleagues at the U.S. Chemical Safety
15 Board have developed wonderful video animated recreations of
16 accidents. We use those. We reach out every place we can to
17 try to find things that replicate, but not duplicate, what we
18 confront in our workplaces, and we use these at all levels in
19 the organization, you know, to start getting people to think
20 about hmmm, what would we do, how would we respond, how do we
21 understand, how does that relate to our situation.

22 So in that respect, you know, I believe that what
23 we're doing is by engaging them in those discussions, you know,
24 we are not sitting down and saying well, this is the Stamford
25 rational decision making model, you know, or this is Gary

1 Kline's (ph.), you know, recognition prime decision model.
2 Although clearly some of us understand that stuff and we
3 research it because this is the science that we want to use we
4 don't talk about that stuff. We say here's the situation,
5 let's start talking about it. And, therefore, we hope that
6 that discussion behavior and questioning will then carry
7 through into how they work together. So we do those things.

8 DR. KOLLY: Dr. Roberts, did you have anything you
9 wanted to add?

10 DR. ROBERTS: Well, I think that Earl said it
11 correctly. We use a whole lot of case studies and try to make
12 people think of different options and alternatives. And we do
13 that anyway in our -- Harvard invented the case study we use,
14 but it's a very good device, or tabletop exercise are good or
15 simulations are good. Make people think. That's the whole
16 point.

17 DR. KOLLY: Thank you very much. I have no further
18 questions.

19 CHAIRMAN SUMWALT: Thank you, Dr. Kolly. Mr.
20 Dobranetski?

21 HEARING OFFICER DOBRANETSKI: Mine is more of a
22 question than a comment, but if you'd like to comment on it I'd
23 appreciate it. I think your presentations were very timely and
24 appropriate and very powerful. Now I think all we need to do
25 is find some way of setting egos aside and allow the seeds to

1 grow because we've got a lot of fertilizer. Any comments?

2 MR. CARNES: I grew up on the farm, so I question how
3 you're using the word fertilizer.

4 CHAIRMAN SUMWALT: Thank you. I, too, think this has
5 been a very interesting panel, and I do want to thank the
6 witnesses. Dr. Roberts demonstrated that all modes of
7 transportation, any mode of transportation, has potential
8 hazards. I think it was about five weeks ago that you were
9 walking perhaps down some steps and you shattered your ankle.

10 DR. ROBERTS: Indeed.

11 CHAIRMAN SUMWALT: And I know it has literally been
12 painful for you to get here. I think initially the airlines
13 stuck you in a middle row in a coach class seat, which can be
14 painful under ordinary circumstance, so thank you for taking
15 the time to get here. I think this has been very worthwhile.

16 The way we got on this idea of a high reliability
17 organization panel is -- well, we all planned what should be a
18 part of this public hearing and I was -- I've been haring the
19 term. I've sat on a couple of HRO roundtables over the last
20 couple of years and I just had ordered a new book, Learning
21 from High Reliability Organizations, and I picked it up and I
22 just turned to the first page, the preface.

23 And, Dr. Roberts, I'm going to read the first
24 paragraph out of the preface and ask your opinion, if you think
25 this is right, but I want to make the point that it does have

1 some examples in here of some things -- I am not in any way
2 prejudging what might have been the factors on the June 22nd,
3 2009 WMATA accident, but it's what's written in this book here,
4 and I want to ask your opinion if -- what you think.

5 It says and I quote, "Train crashes, space shuttle
6 accidents and oil refinery fires all have very different
7 physical causes, but at the organizational and cultural levels
8 the root causes are surprisingly and distressingly similar.
9 Mindless cost cutting, incentive schemes that divert attention
10 from safe operations, failure to consider the safety
11 implications of organizational changes, all of these have
12 regularly been found to have contributed to major accidents."
13 And in the next paragraph it says that we can hope to prevent
14 accidents by studying organizations that don't have accidents,
15 so-called highly reliable organizations.

16 And that was our intention of having this panel, was
17 to learn more about high reliability organizations so that
18 perhaps that message could be extrapolated to other modes of
19 transportation, not just the rail transit industry, but other
20 modes of transportation including walking down steps. But I
21 would like to know your opinion of that paragraph? Was that --
22 do you agree with what was stated in that paragraph?

23 DR. ROBERTS: Yes, I do, and it's surprising how when
24 you put together a group of people that you think are running
25 organizations well, which is what we did. When we first

1 started out we had a focus group of people running
2 organizations that we thought were run very well. Their
3 processes are similar to each other. And then you find
4 organizations that seem not to run so well, to have had serious
5 accidents. All of their processes are similar to one another.
6 And that's why I recommended to you the Columbia Accident
7 Investigation Board Report, which is a very good report
8 available from the Government Printing Office, and it says
9 things that will -- that you'll see reflected, I think, in
10 many, many organizations. But we began by studying the good
11 ones. Of course, after a little while people asked us to come
12 in and study the bad ones.

13 CHAIRMAN SUMWALT: And you mentioned the Columbia
14 Accident Investigation Board. You can -- don't even have to
15 get it off the -- you can get it off the Internet, the report
16 itself.

17 DR. ROBERTS: Yeah.

18 CHAIRMAN SUMWALT: You can Google it or Yahoo it or
19 however you like, but I frequently --

20 DR. ROBERTS: Very good.

21 CHAIRMAN SUMWALT: -- just pull it up and look at it,
22 and I believe that Section 7 of that report dealt with the
23 organization factors.

24 DR. ROBERTS: Yes, Chapter 7.

25 CHAIRMAN SUMWALT: Chapter 7. And, again, that's

1 available on the web, Columbia Accident Investigation Board. I
2 look at it often. And as it talks about organizational
3 accidents, what is an organization accident?

4 DR. ROBERTS: Well, we look at -- to be -- we look at
5 special organizational accidents in which slips and falls have
6 been the subject of much industrial psychological research for
7 years and years and years and years and years. Well, slips and
8 falls assumes that one person causes his own slip or fall. I'm
9 not even sure that's true, but what we were really interested
10 in was looking at the fabric of the organizations that run very
11 well, and then ultimately we were asked to look at the fabric
12 of some organizations that didn't run so well and Columbia was
13 one of those. I was one of the testifiers on the Columbia
14 accident.

15 And so we're looking at more -- I don't want to use
16 the word important, things that do a considerable amount more
17 damage. And as I showed this morning in the Poole quote, he
18 thinks that we're going to be looking at more of this stuff
19 simply because we're building more complex organizations and,
20 of course, some of those organizations are getting to be
21 geriatric, so that's --

22 CHAIRMAN SUMWALT: You mentioned slips and falls, and
23 as we had the chairman of WMATA on Day 1, I asked him -- we
24 went through one of their Safety Committee -- Customer Service
25 Operations and Safety Committee reports and I looked at the

1 metrics that the Board was receiving, and in my classification
2 slips and falls, that's the nomenclature I used, but I pointed
3 out that they were looking at those sorts of things as well as
4 elevator injuries as well as some other rail related -- rail
5 safety related metrics, but I questioned -- I said, you know,
6 are you looking at the right things, and it was a rhetorical
7 question, and as I walked out you grabbed me and said that's
8 one of the classical things that we see, and I think you said
9 solving the wrong problem precisely.

10 DR. ROBERTS: Precisely, yes.

11 CHAIRMAN SUMWALT: And can you discuss that, please?

12 DR. ROBERTS: Yes, I can. Some of you have taken
13 statistics and know about a Type I and Type II error. I
14 believe -- I've taken that course, too. But a Type I error is
15 called a false-positive and a Type II error is a false-
16 negative. Well, you see there's a Type III error, and the Type
17 III error is solving the wrong problem precisely, so you may
18 think you have -- you're looking at the correct problem, but
19 you're not. And I think slips and falls is one sort of
20 accidental problem and I'm here to prove it, but there is
21 another sort of accidental problem that goes much deeper into
22 the fabric of the organization.

23 CHAIRMAN SUMWALT: Thank you.

24 DR. ROBERTS: That's it, solving the wrong problem
25 precisely, picking the wrong problem, not looking far a field

1 enough to what is the correct problem.

2 CHAIRMAN SUMWALT: Okay. So I guess the real
3 challenge is trying to figure out what are the proper metrics
4 you should be looking at.

5 DR. ROBERTS: Right.

6 CHAIRMAN SUMWALT: And I had wrongly assumed until I
7 did some research -- well, I didn't -- it wasn't research. I
8 read some papers, I think, by BST out of Ojai, California, and
9 I have been misled in thinking that an organization that had
10 good industrial safety, good OSHA related safety, would also
11 have good production safety, but I think --

12 DR. ROBERTS: Not necessarily.

13 CHAIRMAN SUMWALT: Yeah, not necessarily. And that's
14 what I learned from reading the BP Texas City Oil Refinery
15 accident and you're verifying that as well.

16 Dr. Hartley, I realize that you're not an expert in
17 rail transit, but based on your personal experience and based
18 on the experience of B&W Pantex do you feel that if properly
19 applied the rail transit systems in this country can, if they
20 apply the HRO principles, will achieve a measurable improvement
21 in safety?

22 DR. HARTLEY: The answer is simply yes.

23 CHAIRMAN SUMWALT: What was that, simply yes?

24 DR. HARTLEY: Simply -- the fact of the matter is any
25 organization applying these basic concepts can improve safety,

1 and I want to do two things. One, go back to what Karlene
2 mentioned here, you know, the slips, trips and falls. We call
3 that individual accidents, and then the mega event like we hope
4 we never have at Pantex is a systems type of accident, that
5 kind of slide that I showed here. The HRO as we defined it is
6 focused on preventing that systems accident because that's the
7 one that has the mega consequence for the whole world and the
8 whole nine yards.

9 One thing we found out, by the way, is that by
10 focusing on that systems accident or preventing that systems
11 accident we have actually increased or improved our individual
12 safety statistics to the point where we're probably the lowest
13 at least in the production plants within DOE.

14 Now I would tell you two things. One, we don't want
15 to pat ourselves on the back for that because that's a
16 byproduct of the process, but the bottom line is that that's
17 kind of your entry fee in playing the game of high reliability.
18 If you don't have, you know, the basic fundamentals down, i.e.,
19 good safety statistics or good safety processes, you can't take
20 it to the next level.

21 But going back to your discussion earlier is that
22 truly the fundamental underlying cause of organizational
23 accidents is the organization or the people within it, and so
24 these concepts here are not specific to Pantex or any kind of
25 technology at all. They rely or they feed on the

1 organizational parts of the problem here. So I think -- again,
2 this is not new. This is not rocket science. This is just
3 basic fundamentals that applied properly any organization can
4 improve their safety programs by looking at concepts of high
5 reliability.

6 CHAIRMAN SUMWALT: Thank you. So good answer, and
7 the short answer is that by applying these HRO principles
8 transit rail or rail transit could achieve measurable safety
9 improvement. How about a measurable safety -- a measurable
10 improvement in efficiency?

11 DR. HARTLEY: Well, going back to Earl's example
12 there, and we always have these questions raised, is there a
13 good business case for high reliability beyond the safety and
14 the answer is definitely yes.

15 You know, typically when an operation runs safely
16 it's much more efficient, much more cost effective because
17 you're not stopping operations and going back and fixing
18 problems, so I think this whole concept of high reliability,
19 like Karlene mentioned, is not only just safety, but safety and
20 productivity both.

21 We at Pantex aptly have to take nuclear weapons apart
22 because of the safety of the DoD, you know, the nuclear
23 deterrent. We have no option except to do this kind of work,
24 but we must do it safely because of the consequences.

25 CHAIRMAN SUMWALT: Thank you. And the third part of

1 what I'm asking is by implementing HRO principles in the rail
2 transit industry could they achieve a cost savings based on
3 what you know from implementing this at B&W Pantex?

4 DR. HARTLEY: Well, I would say I had to go back to
5 the evidence that Earl mentioned in the intro.

6 CHAIRMAN SUMWALT: And let's go ahead and pull that
7 slide up. It's cued up already, so we'll go ahead and project
8 it on the screen.

9 DR. HARTLEY: And I'll let Earl talk to this slide if
10 you want to discuss the slide, but again, you know, we're not
11 in the business at Pantex of making a so-called profit. We're
12 here to do a particular job for the DOE and doing it most
13 safely and most effectively.

14 But the bottom line is I would say what we have
15 evidenced so far is by doing the high reliability types of
16 processes we have freed up some of our resources to refocus on
17 any more safety issues because of the efficiency with which we
18 have attained but, again, it's not to make a bigger profit,
19 it's simply to have more resources focused on more safety
20 aspects of the process.

21 CHAIRMAN SUMWALT: Thank you. And I think that this
22 is a very telling slide here. I'm going to pull it back up
23 again, but all of the bad things have gone down and the good
24 things have gone up, so I think that's pretty telling there.
25 The chief -- Chief Taborn asked a good question, how much does

1 it cost. And tell me this. Yes, it may cost something, but do
2 the benefits -- and I'll address this to Rick. Do the benefits
3 outweigh the cost?

4 DR. HARTLEY: Yes, and I would say that's more
5 objective than subjective. I guess I go back to the old TV
6 commercial. I can't remember if it's Visa or American Express,
7 you know, this thing about being priceless, whatever it was.
8 But the question is going to be is what's the cost of having an
9 accident, in particular a consequential accident, and I go
10 beyond just a particular organization to the country in
11 general.

12 Like Karlene mentioned, a lot of industries are
13 becoming very tightly coupled, and so when one has a major
14 issue the whole country has a major issue. And we at Pantex,
15 if we have a major issue in our particular facility, the whole
16 country will be paying a dear price for that, and we personally
17 pay the price, of course, so I would say yes, it's absolutely
18 doable and aptly essential in some cases and probably more
19 applicable to lots of other organizations besides just Pantex.

20 CHAIRMAN SUMWALT: Thank you. And another question
21 that Chief Taborn asked was how long does it take, and, Mr.
22 Carnes, you indicated that it's not a destination, it's a
23 journey and a journey begins with the first step. So, Mr.
24 Carnes, what is the first step?

25 MR. CARNES: I believe the first step is this kind of

1 discussion with the right people in the room. One of the
2 slides I showed was the overview -- the new view. The first
3 thing we have to do is engage people at senior levels, manager
4 levels, who have been very, very successful in their careers in
5 this discussion about error and systems.

6 And Rick used the phrase about the lights turning on.
7 I believe because I have yet to find this not be true -- and
8 I've been involved with training, facilitating thousands of
9 people on this. I believe that you take successful, competent
10 technical people, experienced, who've had some life experience,
11 and expose them to this discussion and I see them go oh, that's
12 why this happened because they're not trained in psychology,
13 they're not trained in social systems. That's what Karlene
14 does and we learn from that, but when we expose them to these
15 ideas they go oh, you know, I've tried to fix that and I've
16 tried to fix that, it keeps on happening. That's a different
17 way of thinking about it.

18 That's where I believe the discussion starts and once
19 you see that switch, oh, it's our systems and it's our defenses
20 that we got to work on first, now they know -- see, they can
21 manage that. They've been trying -- the E-3. They've been
22 trying to fix people. They can't fix people. They can fix
23 systems to enable people to succeed. I think that's a start,
24 sir.

25 CHAIRMAN SUMWALT: Thank you very much, and I think

1 that's part of what we're trying to do is we're trying to learn
2 about this so that we can help people to come to that
3 realization that it's time to make that first step.

4 The question many times has come up over the course
5 of this week about safety culture. I remember posing the
6 question on Day 1 to members of the first panel about what is a
7 safety culture and I think the answers were, in my opinion,
8 good. I'm not sure that I could rattle off the best definition
9 of a safety culture even though I feel like I'm fairly
10 knowledgeable in what it is.

11 I don't -- you know, I've always said -- I was asked
12 this the other day, what's safety culture? I said well, it's a
13 -- you know you have it -- you know you're on the right road
14 when you when your employees are doing the right things even
15 when no one is watching, but even still that's not a definition
16 and I'm not so worried about the definition.

17 What I'm interested in is what are the
18 characteristics of it, how do I put those mechanisms in place?
19 And when I talked with Professor Mascotti (ph.) at the
20 University of Southern California when he and I taught courses
21 together I would talk about safety culture and I'd say these
22 are metrics that I feel -- measures that can be put in place to
23 form that pathway towards that journey. And so I'd like to
24 know from Dr. Roberts if you feel these are some of the right
25 things.

1 I think, first of all, you need a management
2 commitment to safety and I'll name them all. I think you need
3 the management commitment to safety, and I've said that
4 management starts at the top and it permeates throughout the
5 entire organization.

6 I think you need standardization and discipline,
7 which means that you have good written policies, procedures and
8 guidelines and that people follow them and that you are very
9 dogmatic about ensuring that people follow those procedures.

10 I think you need good training. You need to ensure
11 that you are training employees for the things that they're
12 expected to accomplish.

13 And, finally, I think that you need good data
14 collection and analysis. I think you need methods to keep your
15 finger on the pulse of what's going on so that you can measure
16 the temperature of what your operation is doing. You need a
17 just culture whereby people -- and this is part of data
18 collection and analysis because people don't supply you with
19 information unless you have that just cultural, but a just
20 culture basically means that when people report to you, you
21 have established -- hold on, you have established an attitude
22 of trust where people will report information to you because
23 they realize that not all errors or unsafe acts will be
24 punished. Those "honest mistakes" will be actually rewarded.

25 You know what, we don't appreciate the fact that you

1 committed an error, but you came to us, you learned from it or
2 we're going to learn from it and we're going to plow that
3 institute -- we're going to plow that back into the
4 organization or we're going to reward people for reporting to
5 us errors.

6 But on the other hand if someone crosses that line
7 and they intentionally deviate from a procedure or they
8 intentionally are careless or perhaps reckless, we can't
9 tolerate that. We do need accountability in a just culture.
10 But that's basically it, management commitment,
11 standardization, training and data collection and analysis. Do
12 you feel that those are good measures to help an organization
13 on their journey towards safety culture?

14 DR. ROBERTS: I think those are excellent measures.
15 I would only add one thing. If you have standardization and
16 specialization you've got to have coordination, too.

17 CHAIRMAN SUMWALT: Thank you very much.

18 It is getting to be that time of the day and your car
19 is coming in six minutes, Dr. Roberts, maybe five minutes, so
20 when we conclude the witnesses will be excused, and since there
21 are no further witnesses to be called to testify at this time,
22 this portion of the Safety Board's investigation is concluded.
23 However, I want to emphasize in accordance with our procedures
24 this investigation will remain open to receive at any time new
25 and pertinent information regarding the accident. The Safety

1 Board may at its discretion reopen the inquiry in order that
2 such information is made a part of the public record.

3 As parties to the hearing, and this is important, as
4 parties to the hearing, you have the opportunities to submit
5 proposed findings of facts, conclusions and recommendations.
6 And parties wishing to do so, and I would, frankly, encourage
7 you do so, as a Board member I would encourage you to make a
8 party submission. They should be submitted to the NTSB, Mr.
9 Dobranetski, by March the 19th, 2010, March the 19th.

10 When you submit your submission to the NTSB, in
11 accordance with our rules you must also send copies of your
12 submissions to all of the other parties. Any and all such
13 proposals will be made part of the public docket and they will
14 receive careful consideration during the Safety Board's
15 analysis of the evidence and during preparation for the Safety
16 Board's final report of this accident.

17 As a Board member, one of the Board members who votes
18 on the final product, I make it a point to read the submissions
19 carefully. It's a way for me to make sure that the product
20 that comes before me to vote on is balanced. The staff does an
21 excellent job in their investigation, but I want to know all
22 the sides so I read the submissions and I believe my colleagues
23 do as well, and that's why I encourage you to make a party
24 submission.

25 From the evidence collected the Safety Board will

1 determine the probable cause of the accident and we will make
2 any recommendations necessary to prevent a similar accident.

3 Now the final report will take several months to
4 complete. However, as we all know, the Safety Board will and
5 has on this accident -- we will issue urgent recommendations or
6 interim recommendations if we find deficiencies or areas that
7 need to be corrected immediately. We have done this on this
8 accident and, again, if we find things in the interim we will
9 issue recommendations in that area.

10 So on behalf of the NTSB I want to thank all of the
11 parties for their participation in this hearing. I want to
12 thank you for your cooperation. I think this has been an
13 excellent hearing. We've gotten new information, important
14 factual information, and that is one of the very significant
15 points of the hearing. We are here in the fact-finding
16 investigation phase.

17 Also, on behalf of the Board of Inquiry and the
18 Technical Panel I want to express our sincere appreciation to
19 all of the groups, companies, associations and agencies who
20 have participated throughout, and I personally want to thank
21 the families, those who have sat through this and those who
22 have lived with this for the last eight months. I thank you
23 for being here.

24 And, last and not least, I want to thank all of the
25 witnesses. I think we had 21 witnesses this week who gave

1 testimony. We have a saying at the NTSB that from tragedy we
2 draw knowledge to improve the safety of us all, and that is our
3 commitment here. We are here to learn from this tragedy.
4 We're here to learn from it so that it does not happen again.
5 This hearing is now adjourned.

6 (Whereupon, the hearing was concluded.)

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CERTIFICATE

This is to certify that the attached proceeding before the

NATIONAL TRANSPORTATION SAFETY BOARD

IN THE MATTER OF: COLLISION OF TWO WASHINGTON
METROPOLITAN AREA TRANSIT AUTHORITY
TRAINS NEAR FORT TOTTEN STATION,
WASHINGTON, D.C., JUNE 22, 2009

PLACE: Washington, D.C.

DATE: February 25, 2010

was held according to the record, and that this is the
original, complete, true and accurate transcript which has been
compared to the recording accomplished at the hearing.

Timothy J. Atkinson, Jr.
Official Reporter